NATIONAL STEEL FABRIC



NATIONAL STEEL FABRIC CO.
PITTSBURGH. PA. U.S.A

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Mike Jackson, FAIA



NATIONAL STEEL FABRIC

NATIONAL Steel Fabric is a welded, cold drawn steel wire mesh, made in various gauges and spacings of wires, suitable for a great number of purposes:

National Stucco-Plaster Reinforcement (pages 2 to 23 of this catalog) is used as a combined base (lath) and reinforcement for Cement and Magnesite Stucco Exterior Walls, for Plaster Interior Wood Joist and Suspended Ceilings, Walls, and Partitions, and for Porch and Bathroom Cement and Composition Floors.

National Building Fabric (pages 24 to 32 of this catalog) is universally used as a reinforcement for Concrete Floors in Buildings, Garages, Warehouses, Etc., for Concrete Driveways and Sidewalks, Retaining Walls, Concrete Pipe, Sewers, Culverts, Conduits, Reservoirs, Oil and Water Tanks—for Concrete and Gypsum Roofs—for Beam Wrapping, Fireproofing Steel Frame Work, Cement Gun Work, Revetment Work, Levee Work, Canal Lining, Etc.

National Road Fabric is the standard reinforcement for Reinforced Concrete Roads (Send for National Road Fabric Bulletin).

NATIONAL STEEL FABRIC COMPANY

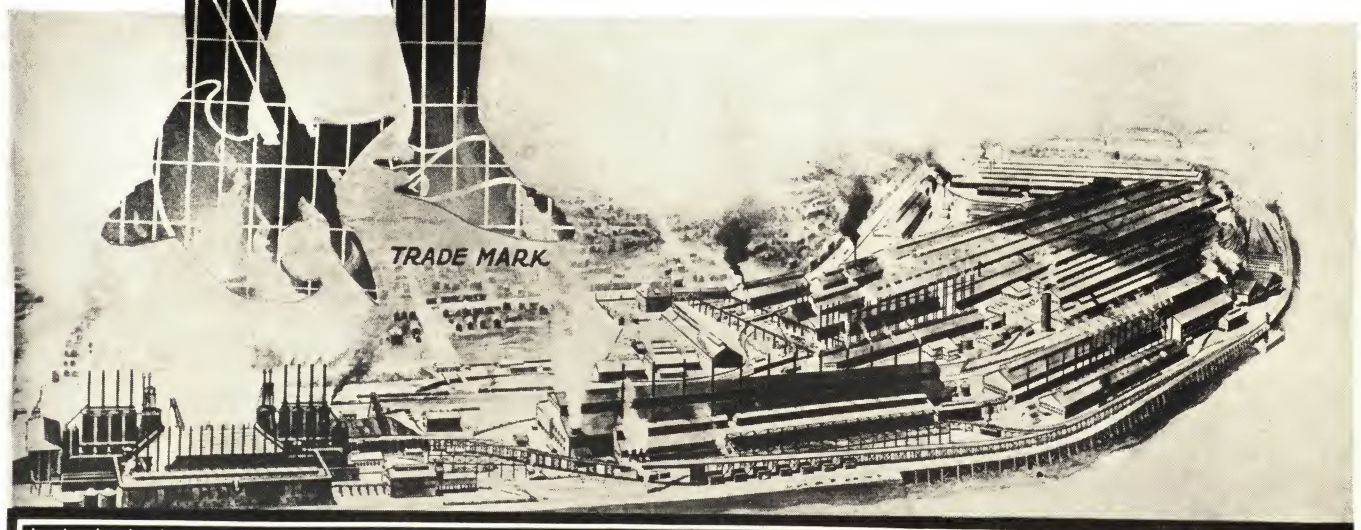
(Subsidiary of Pittsburgh Steel Co.)

World's Largest Manufacturers of Welded Steel Fabric

777 UNION ARCADE **PITTSBURGH, PA.**

SALES OFFICES:

Atlanta Chicago Cleveland Detroit Houston Los Angeles New York Philadelphia St. Louis San Antonio San Francisco



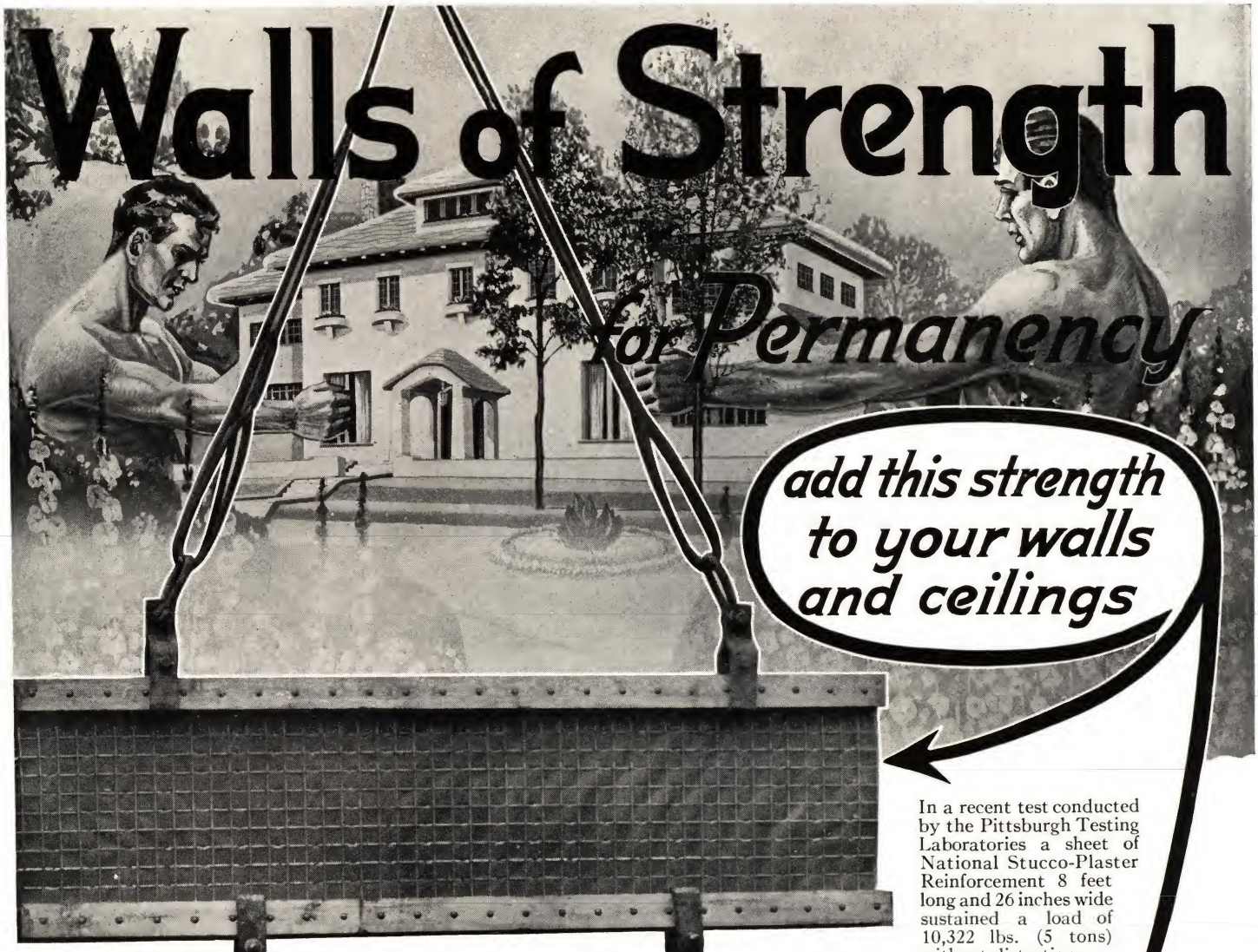
NATIONAL STEEL FABRIC CO

Subsidiary of PITTSBURGH STEEL CO

UNION ARCADE BUILDING PITTSBURGH, U.S.A

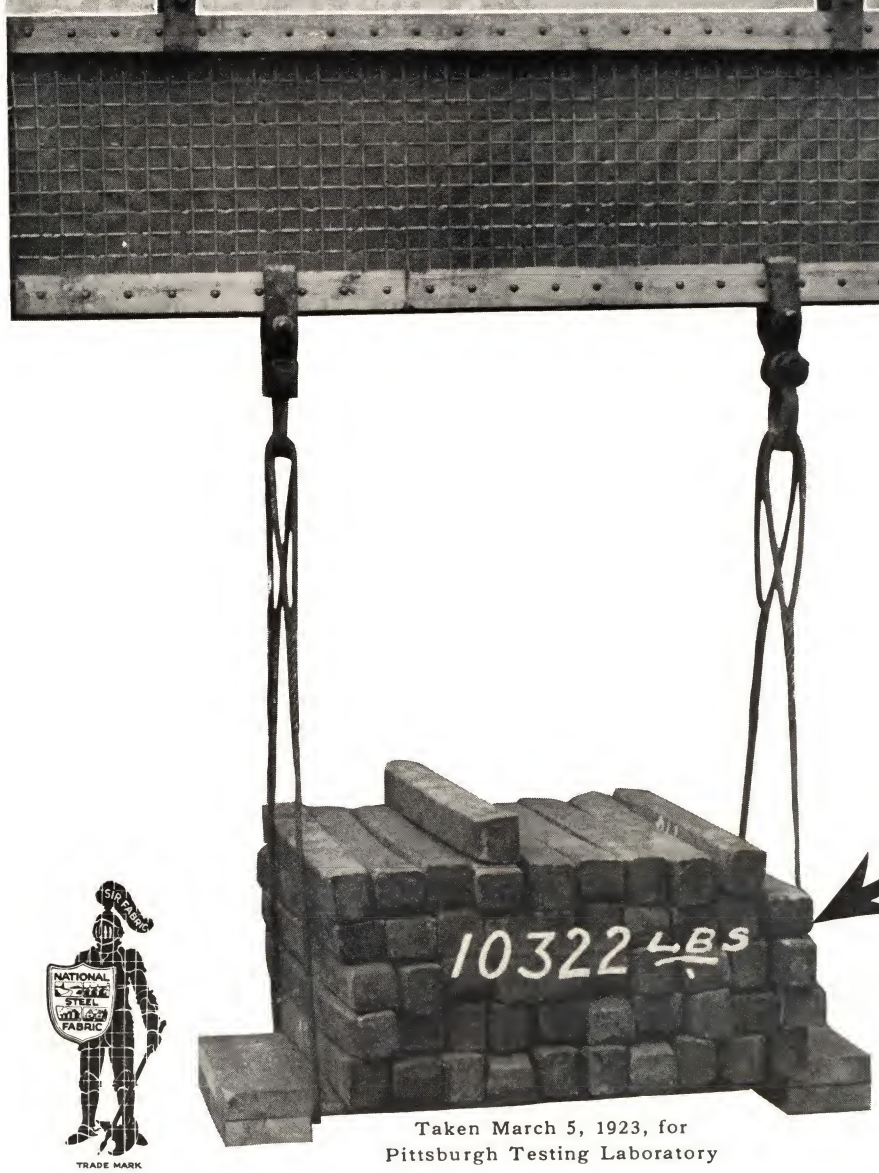
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Walls of Strength for Permanency

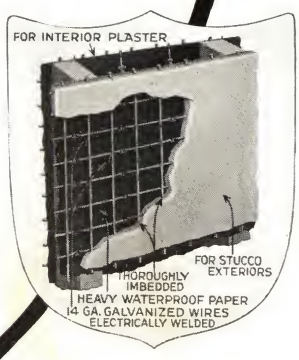


add this strength to your walls and ceilings

In a recent test conducted by the Pittsburgh Testing Laboratories a sheet of National Stucco-Plaster Reinforcement 8 feet long and 26 inches wide sustained a load of 10,322 lbs. (5 tons) without distortion.



Taken March 5, 1923, for
Pittsburgh Testing Laboratory



The enormous strength of National Stucco-Plaster Reinforcement embedded in your walls and ceilings of plaster and stucco is the best assurance of permanent construction.

TRADE MARK

The R. W. Hunt & Co. "Racking" Test

THE test described below proves conclusively that National Stucco-Plaster Reinforcement assures *permanent* walls and ceilings by *reinforcing* them against cracking and final failure.

The test proves, furthermore, that National Stucco-Plaster Reinforcement actually strengthens and *reinforces* the entire framework of the buildings upon which it is applied.

LONDON OFFICE, 52 QUEEN VICTORIA ST., E.C.4.
CABLE ADDRESS "ROBHUNT"

NEW YORK 53 PARK PLACE
PITTSBURGH MONON BANK BDG.
ST. LOUIS SYNDICATE TRUST BDG.
SAN FRANCISCO 251 KEARNY ST.
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ROBERT W. HUNT & CO. ENGINEERS.
BUREAU OF INSPECTION, TESTS & CONSULTATION
GENERAL OFFICES "2200 INSURANCE EXCHANGE" CHICAGO.
TELEPHONE "WABASH 6780"

ROBERT W. HUNT
JNO. J. CONE
D. W. McNAUGHER

PITTSBURGH May 19, 1923.

TO INSURE PROMPT ATTENTION ALL COMMUNICATIONS SHOULD BE ADDRESSED TO THE FIRM

IN REPLY PLEASE REFER TO
FILE NO. 3179-1 B95045

National Steel Fabric Company,
Union Arcade,
Pittsburgh, Pennsylvania.

Gentlemen:—

We submit the following report on tests of Wall Panels, made May 15, 1923, at your Company's plant at Monessen, Pennsylvania.

Wall panels were made up in the following manner:

All panels were on frames which measured 8 ft. by 4 ft. out to out. On the long side there were two 2″ x 4″ pieces and between those there were seven 2″ x 4″ pieces representing studding. These were spaced about 16″ apart. They were spiked to the long 2″ x 4″ pieces with three twenty-penny spikes at each end of each stud. In these respects all panels were alike The panels were differently treated in the matter of covering, as described in the following:

PANEL A—This panel was covered on one side with 7/8″ sheathing put on with eight penny nails. The other side was covered with 1/4″ x 1 1/2″ wood lath, spaced 1/4″ apart, fastened with standard lath nails, 1 1/4″ long. There was no plaster on this panel.

PANEL B—This panel had wood lath on one side, as described in Panel A, not plastered. The other side was plastered on National Stucco-Plaster Reinforcement, Style P-214. This stucco reinforcement was secured to the studding with 14 gage staples spaced 4″ apart. The plaster mixture was 1:3 mix, Portland cement stucco, with 10% of lime. It was worked out to a 3/4″ ground.

PANEL C—This panel was lathed and plastered on one side in the same manner as Panel B, using P-214 Reinforcement. The other side had reinforcement put on with the staples in the regular way, using Style P-414, but that side was not plastered.

PANEL F—One side of this panel was covered with wood lath in the regular way previously described, but that side was not plastered. The other side was plastered in the regular way, previously described, using National Reinforcement, Style P-414, put on in the regular way.

The 4 ft. dimension of the panels represents the height, as the studs are vertical when the panels were placed with the long side on the ground; also the wood lath are then in a horizontal position. It is in this position that the panels were tested. In the test each panel was bolted down to a timber frame and a pull was applied close to the top edge in a direction in the plane of the panel.

To bolt the panel down a 3/4″ bolt was used clear through the panel at the end away from the direction of the pull. Also hook bolts were used through the bottom 2″ x 4″. In addition to this a wooden wedge was driven, at the bottom of the panel, against a block, to take the horizontal thrust.

A steel strap was passed around the panel close to the top and the pull was applied through this strap, the load being measured by a 5000 lb. capacity dynamometer previously calibrated.

The accompanying blue prints show the deflections under the increments of load as applied. These deflections are the horizontal movement of the top of the slab.

It will be observed that Panel A reached the limit of its rigidity at about 1200 lb., as the deflection curve takes a steep direction at that load. It is seen that at a higher load the panel stiffened up. It was out of shape at this stage, and the reason for the apparent stiffening of the panel is that the sheathing boards came into contact by rotation of the frame and resisted further distortion.

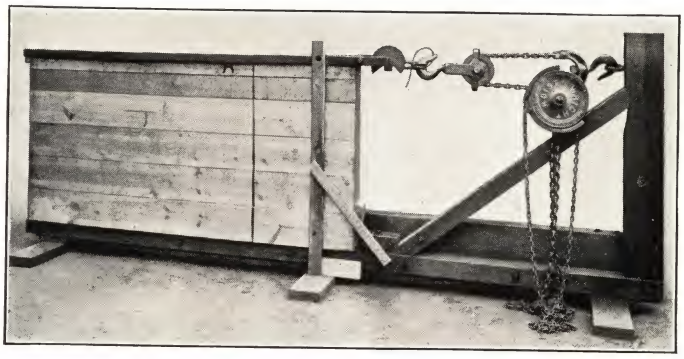
In the other panels there is exhibited great rigidity of the plastered slab. In fact, while cracks appeared when nearly the maximum load was reached, these cracks had little to do with the amount of pull that the slab would stand. Failure was in every case due to the staples slipping on the wires, or the distortion of the wires at the staples, or to staples pulling out of the wood. These slabs stood a maximum horizontal pull of 4400 lb. for Panel B and Panel C, and 4000 lb. for Panel F.

The National Reinforcement used in these tests is made of galvanized wire, 14 gage. Style P-214 has wires 2″ apart each way. Style P-414 has the wires 2″ apart one way and 4″ apart the other way. There is a waterproof paper backing, and the wires lie for the greater part of their length on the side of this paper which is to receive the plaster. The "key" for the plaster is effected by plaster which grips and covers the wires when the stucco or plaster is applied.

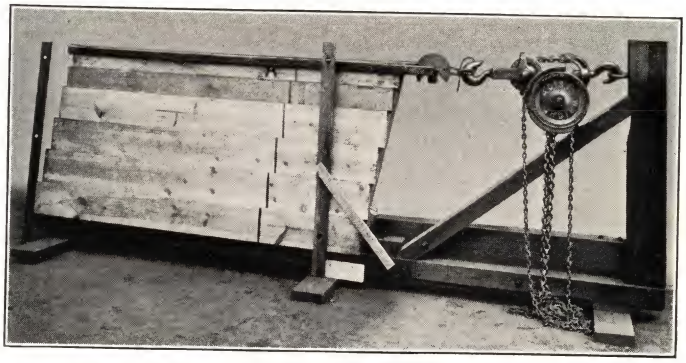
Respectfully submitted:
ROBERT W. HUNT & CO.
BY EDWARD GODFREY.

EG:CG

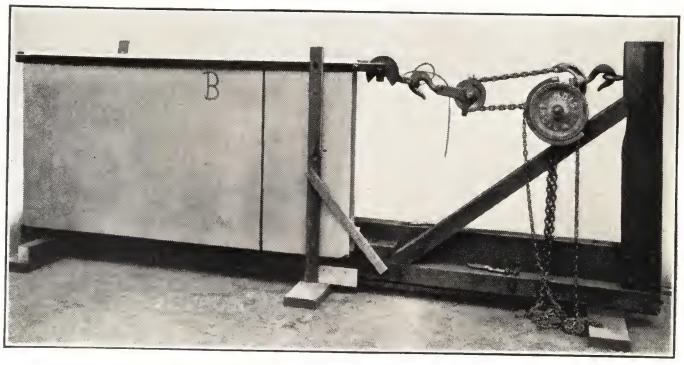
NOTE: See graphic description of this test on page 4.



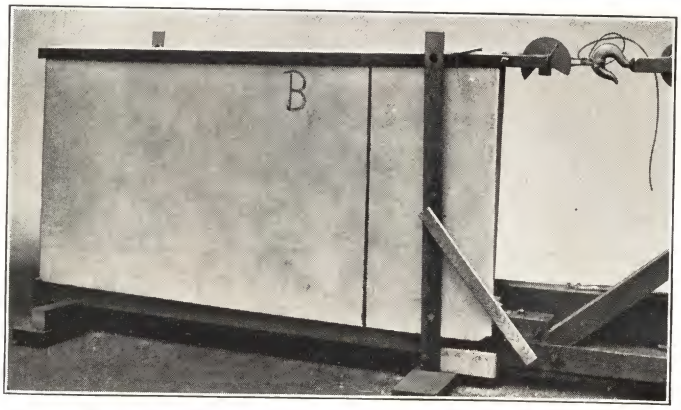
Test Panel A Before Application of Any Load



Test Panel A Reached the Limit of its Rigidity at 1200 Pounds

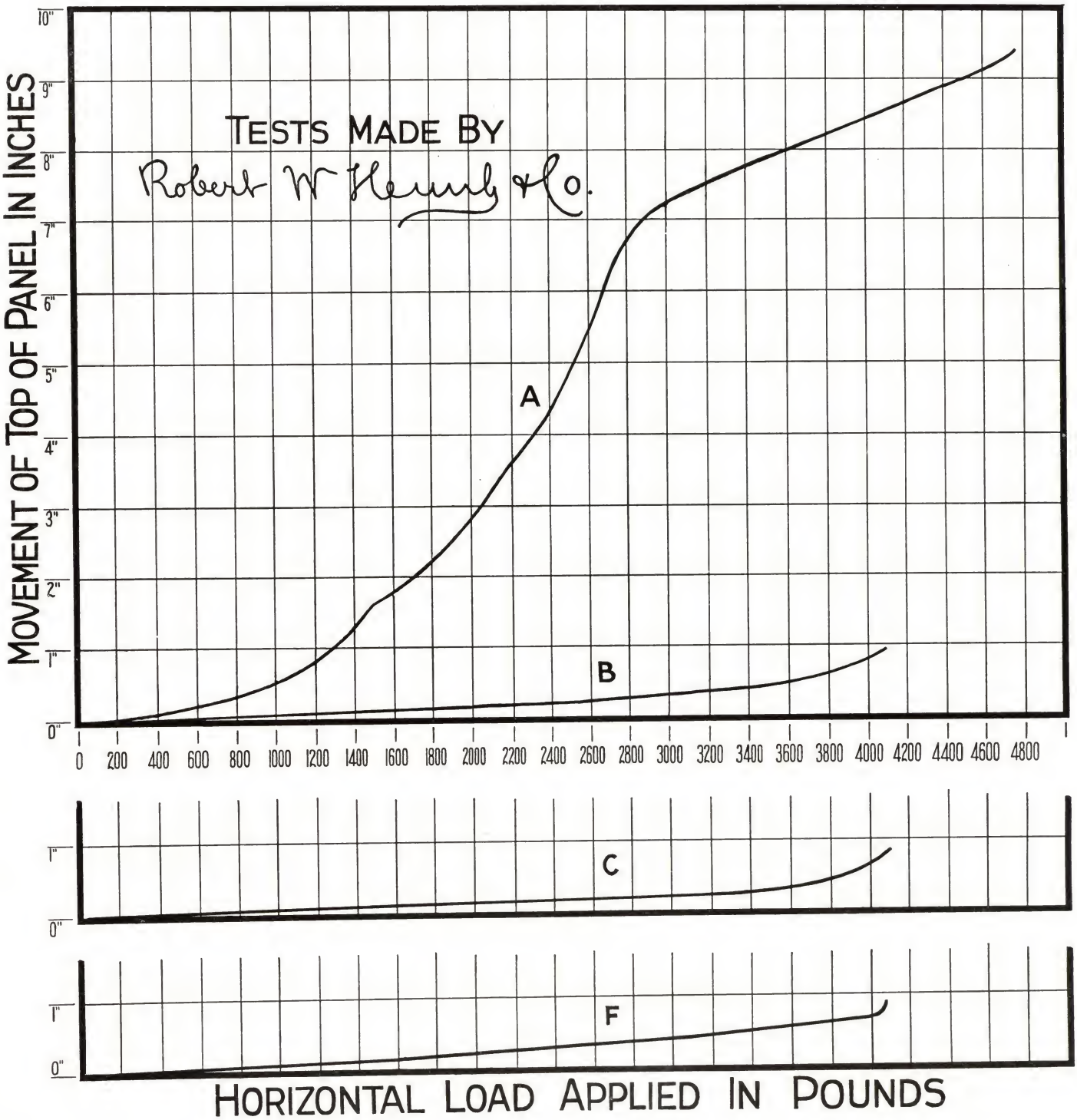


Test Panel B Before Application of Any Load



Test Panel B After Application of 4000 Pound Load

Graphic Description of the R. W. Hunt & Co. "Racking" Test



THE ABOVE CURVES WERE PLOTTED ON THE FOLLOWING READINGS WHICH WERE TAKEN DURING THE TESTS

Curve	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches	Load in Lbs.	Movement in Inches
A	800	15/32	1380	1 3/32	1500	1 19/32	1950	2 5/8	2200	3 5/8	2500	4 3/4	2900	7	4400	8 7/8
B	600	1/100	1000	1/32	1500	3/32	2000	5/32	2500	3/16	2800	9/32	3500	3/8	4000	3/4
C	750	1/32	1500	3/32	2100	1/8	2500	5/32	3000	3/16	3500	1/4	4000	1 9/32		
F	1000	1/32	1500	3/32	2000	5/32	2500	1/4	3000	3/8	3700	1/2	4000	5/8		

NATIONAL Stucco-Plaster Reinforcement is a combined *reinforcement* and base manufactured from No. 14 gauge cold drawn, *galvanized*, welded steel wire, to which is securely fastened an extremely tough and heavy water proof paper backing.

The wire, which develops a tensile strength of more than 60,000 pounds per square inch of steel, functions *primarily* as a *reinforcement*—its part in holding the plastic material in place until set is only *incidental*, as the cohesion of this moist material to the dry paper backing performs at least 75% of the work for which ordinary wood, wire, and metal laths and other bases are *primarily* designed.

Because of this cohesion, the paper backing (which is the highest grade and toughest material on the market) functions *primarily* in holding the plastic material in place until it "sets"—therefore, it accomplishes the same result for which ordinary bases are evidently designed; namely, to hold the material to the wall or ceiling by means of "keys". No material can be wasted in "keys" or in droppings from the front or back of National Stucco-Plaster Reinforcement, and no "forms" are used to hold the material in place.

An incidental yet very vital function of the paper backing (which, because of the manner in which it is fastened to the wire fabric, is very stiff) is that it automatically insures sufficient "grounds" (the proper thickness of plastic material) to meet the standard specifications regarding thickness of slab.

The unique *crimps* that are characteristic of National Stucco-Plaster Reinforcement serve a two-fold purpose:

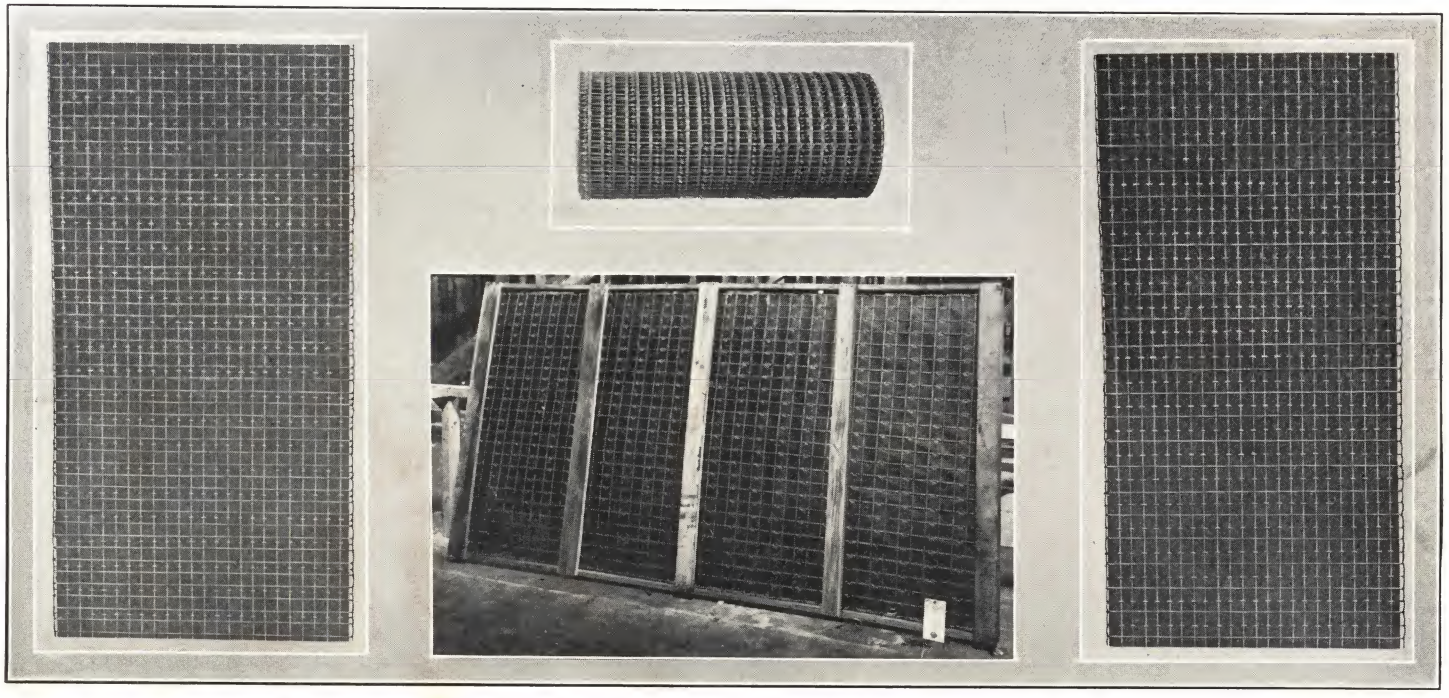
(a) The crimps are forced through the paper backing which is securely locked to the fabric by means of *galvanized* steel wires threaded through the crimps. This permits the steel in the fabric to be above the face of the paper so that the Reinforcement will become embedded when the plastic material is applied.

(b) The crimps make National Stucco-Plaster Reinforcement *self furring* and serve to hold it a uniform distance from the background.

This is a very important feature of National Stucco-Plaster Reinforcement, because it not only eliminates costly furring strips and separate building paper (and labor) and saves material by eliminating "keys", but also insures truly *reinforced* monolithic construction of very high tensile strength.

As the gauge of wire used in the manufacture of National Stucco-Plaster Reinforcement is many times heavier than that used in the "key" types of laths, and as the fabric becomes thoroughly embedded in the slab, it is a physical impossibility for the stucco or plaster to come off unless it takes the fabric with it.

National Stucco-Plaster Reinforcement is a true *reinforcement;* it equalizes the stresses engendered in the slab during the period of expansion or shrinkage when first applied, and also during periods of expansion and contraction due to change of seasons, etc. The 2″ x 2″ mesh (Style P-214) has equal reinforcing value in *all* directions; the 2″ x 4″ mesh (Style P-414) is designed for the less severe strains, particularly for interior plastering.

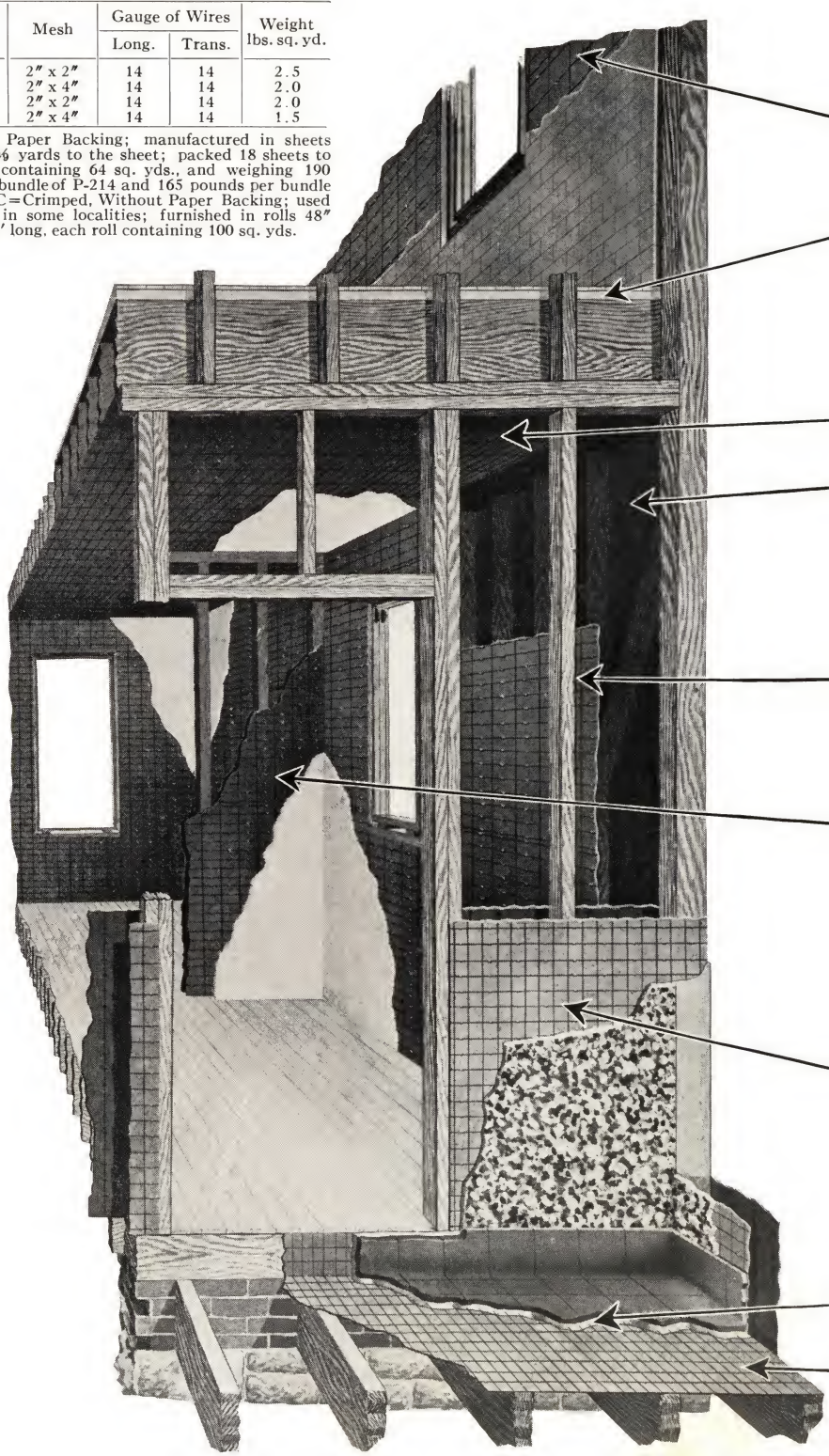


LEFT—Sheet (4′ x 8′) of Style P-214 National Stucco-Plaster Reinforcement. TOP CENTER—Roll (100 Sq. Yds.) of Style C-414 National Stucco-Plaster Reinforcement. BOTTOM CENTER—Bundle Containing 18 Sheets (64 Sq. Yds.) of Style P-214, Ready for Shipment. RIGHT—Sheet (4′ x 8′) of Style P-414 National Stucco-Plaster Reinforcement.

Welded STOCK STYLES *Galvanized*

Style	Mesh	Gauge of Wires		Weight lbs. sq. yd.
		Long.	Trans.	
P–214	2″ x 2″	14	14	2.5
P–414	2″ x 4″	14	14	2.0
C–214	2″ x 2″	14	14	2.0
C–414	2″ x 4″	14	14	1.5

P—With Paper Backing; manufactured in sheets 8′ x 48″; 3⅓ yards to the sheet; packed 18 sheets to the bundle containing 64 sq. yds., and weighing 190 pounds per bundle of P-214 and 165 pounds per bundle of P-414. C=Crimped, Without Paper Backing; used extensively in some localities; furnished in rolls 48″ wide by 225′ long, each roll containing 100 sq. yds.



Saves Time, Labor and Material.

For Wainscots and Tile Mantles.

For Bathroom Floors—Eliminates Forms.

Saves from 10% to 25% of Material by Eliminating "Keys."

For Ceilings—Insurance Against Cracks and Falling.

Toughest Paper Backing Made.

Costs Less in Place. Wires Galvanized; Welded at Intersections.

For Side Walls.

National Stucco-Plaster Reinforcement is Self-Furring.

For Partitions.

Automatically Insures Proper "Grounds."

Automatically Reinforces the Plastic Material.

For Exterior Walls of Portland Cement or Magnesite Stucco—Applied Direct to Studs or Over Sheathing.

Reinforcement Becomes Thoroughly Embedded.

For Porch Floors—Eliminates Forms.

NATIONAL STUCCO-PLASTER REINFORCEMENT IS MANUFACTURED WITH AND WITHOUT PAPER BACKING

The "P" (paper-backed) Styles are furnished in bundles of 18 sheets, each sheet 8′ long by 4′ wide, each bundle containing 64 square yards of reinforcement, and weighing 190 pounds per bundle of P-214 and 165 pounds per bundle of P-414.

These Styles are applied either direct to studs and joists or over sheathing or insulation. Style P-414 is recommended for interior plaster work only.

The "C" (plain—without paper backing) Styles are furnished in rolls 4′ wide; each roll contains 225 lineal feet (100 square yards) of reinforcement.

Reinforcement versus Keys

ANY material, to be held on a horizontal or vertical surface, must have some means of fastening. For wood we use nails; for paper we use paste; for paint we use the natural adhesiveness of the liquid. These types of fastenings, however, are impractical for Stucco and Plaster so, for years, "key" fastenings have been used.

In using wood lath, a space of about ¼" is left between each lath; in metal lath, a sheet of steel is cut or expanded in such a way as to leave small openings in the metal; in stucco board, a dovetailed wood lath is attached to a water proof backing; grooved sheathing is a solid board having dovetailed grooves.

When plastic material is applied to these laths, part of it is pressed in between the openings and allowed to lap over on the other side or to fill the dovetails. When the material hardens, this lap or "fill" holds it to the lath. The plastic material forced through or into the openings is called "keys."

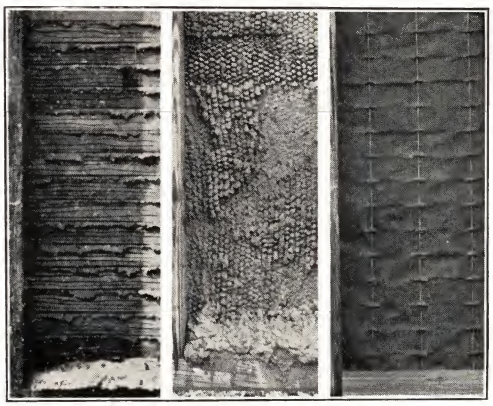
Such construction is not permanent because actions take place that cannot be controlled by man.

The rate of expansion and contraction of wood and stucco (or plaster) is unequal, and difference in moisture content and every temperature change will cause an unequal expansion or contraction of these materials. As the plastic material has a relatively low tensile strength (about 1–100 of that of steel), the brittle "keys" are strained by any movement and soon rupture. Cracked Plaster or Stucco is the result.

Metal lath, when manufactured, leaves considerable naked steel open to the action of the moisture in plaster and stucco. When the moist material is applied, a galvanic action is immediately set up, which causes rust and, in time, completely decomposes the thin metal. Back-plastering retards this action, but where moisture is present galvanic action is bound to occur, and ultimate weakening or failure is inevitable. Once the lath is gone, a slight jar will cause the wall to crack or crumble.

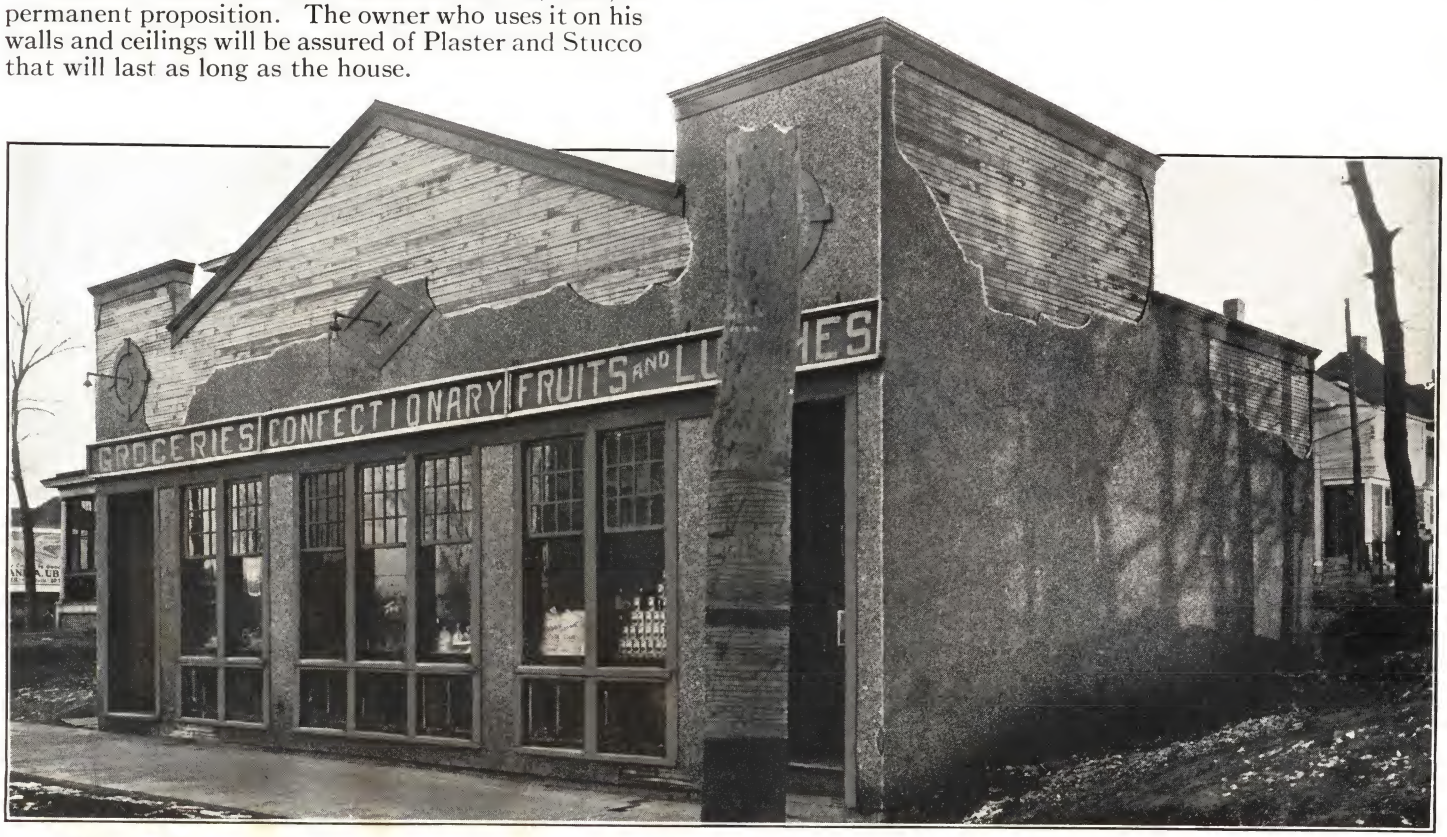
Reinforcement ushers in a new era in this field. Instead of "keys" we use a network of heavy, galvanized wire which becomes an integral part of and thoroughly embedded in the plastic material. To loosen any of the material from this reinforcement would necessitate tearing down the whole structure.

National Stucco-Plaster Reinforcement is, then, a permanent proposition. The owner who uses it on his walls and ceilings will be assured of Plaster and Stucco that will last as long as the house.



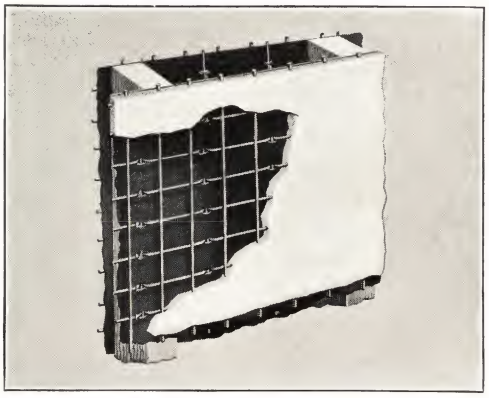
Wood Lath "Keys" **Metal Lath "Keys"** **Monolithic— No "Keys"**

Three Types of Laths or Bases are Illustrated. Note that Only National Stucco-Plaster Reinforcement Provides a Reinforced, *Monolithic* Type of Construction.



A Typical Case—the "Keys" or Fingers Which Held These Stucco Walls to the Grooved Sheathing Were Broken by the Unequal Expansion of the Wood and the Stucco. This Cannot Happen Where National Stucco-Plaster Reinforcement is Used.

For Exterior Stucco Walls



Showing how National Stucco-Plaster Reinforcement Holds Stucco and Plaster in Place and *Reinforces* them at the same Time.

THERE is no *permanent* material so beautiful, so appealing, so economical as Stucco.

Applied, as it is, in a plastic state, Stucco can be fashioned and treated as no other material; color and texture are limited only by the artistry of the designer and craftsman. Smooth or rough, white or tinted, Stucco is adaptable to nearly every type of architecture, with the true fitness of the proper combination of material.

From the moment of application, Stucco has the delightful shades and tones that give a house its home-like appearance as it mellows into the landscape. When properly applied, Stucco improves with age, in looks and in structure.

But no material, unreinforced or unprotected, can long withstand the elements and the natural expansion and contraction to which everything and everybody is subject.

Wood is painted—shingles are creosoted—concrete is reinforced—steel is galvanized—foundations are water proofed—bricks are burned—tin is coppered—silver is lacquered.

All this is done to reinforce or protect—to lengthen the natural life of the various materials.

And so it is that Stucco and Plaster must be reinforced—must be given the necessary tensile strength to withstand expansion and contraction.

If your Plaster or Stucco is not *reinforced*, contraction and expansion will break the brittle "keys" which hold the material in place; small cracks will appear and, as time goes by, the cracks will open until what was once a beautiful surface will take on the appearance of a railroad map.

The only *permanent* way to erect Stucco and Plaster is to eliminate "keys" and hold them together and to the wall by means of a galvanized *reinforcement*.

When you build with Stucco, use National Stucco-Plaster Reinforcement —aside from insuring permanent "Walls of Strength", it is cheaper in place.



Residence of Lorenzo Luce, 1425 Stratford Road, Kansas City, Mo. A. B. Fuller, Architect; J. Ray Miner, Builder. Exterior Walls of Cement Stucco Reinforced with National Stucco-Plaster Reinforcement.

New Houses For Old

SCATTERED throughout the country are numberless old, roomy houses, built in the era of good workmanship and materials, but with poor exterior design—too good to tear down, yet not attractive enough for a home.

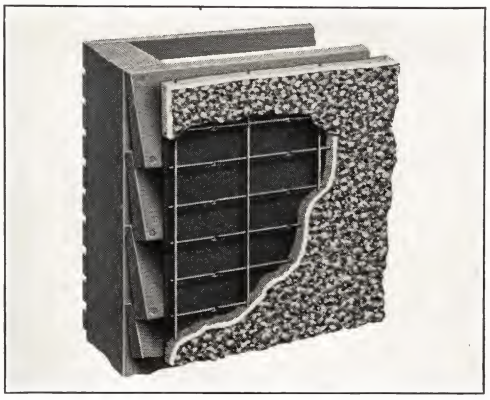
Buildings of this type afford endless opportunities for remodeling in *reinforced* Stucco—by making a slight change here and there, to enhance it from an architectural viewpoint, and "overcoating" it with a *reinforced* Stucco surface.

Such remodeling pays for itself very quickly in increased property value, decreased insurance premiums, elimination of frequent painting and petty repair bills, lower cost of heating, etc., to say nothing of the personal satisfaction of the owner.

National Stucco-Plaster Reinforcement lends itself very admirably to such reconstruction; it is placed directly over the weather boarding, the water proof paper backing acting as a heat and moisture resistant as well as a material-saving base or lath.

Houses remodeled in Stucco over National Stucco-Plaster Reinforcement will never need repairing or repainting; you are assured of *permanent* walls, *reinforced* throughout, free from cracks and discoloration.

Remodel *your* old house—and use Stucco over National Stucco-Plaster Reinforcement for *permanency*.



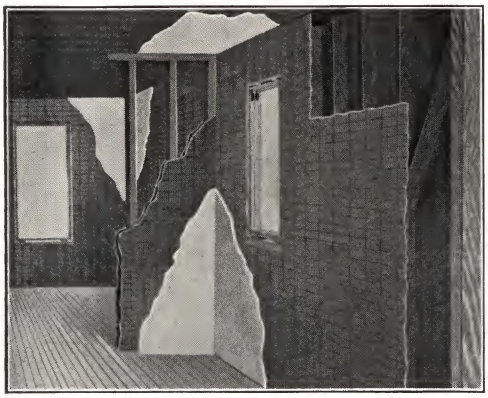
A Section of Stucco, *Reinforced* with National Stucco-Plaster Reinforcement, Applied over Weather Boarding or Siding.



House at 47 Conshohocken Avenue, Philadelphia, Pa.—the Type of House You See Every Day, Everywhere

The Same House, a Little Later—Remodeled in Reinforced Magnesite Stucco. Note the Rejuvenated Appearance

For Interior Plaster Walls and Ceilings



This Illustration Shows the Method of Applying National Stucco-Plaster Reinforcement to the Studs and Joists, and the Plaster to the Reinforcement.

CRACKED and falling plaster are but the inevitable results of poor and therefore costly construction.

Plaster has high compressive (wearing) strength, but is relatively low in tensile (to "give") strength. Therefore when the base (or lath) upon which it is applied is affected (either by swelling caused by dampness or by shrinkage caused by heat, or by a jar, or any other cause), the plaster is called upon for a tensile strength *which it does not possess.*

Cracking and, sometimes, complete failure of the slab, is the inevitable result.

"Keyed in place" ceilings fall because the heavy slab of plaster ruptures the hold of the weak or broken "keys"; plaster walls remain in place, even though cracked, only because the "pull" against the "keys" is not direct.

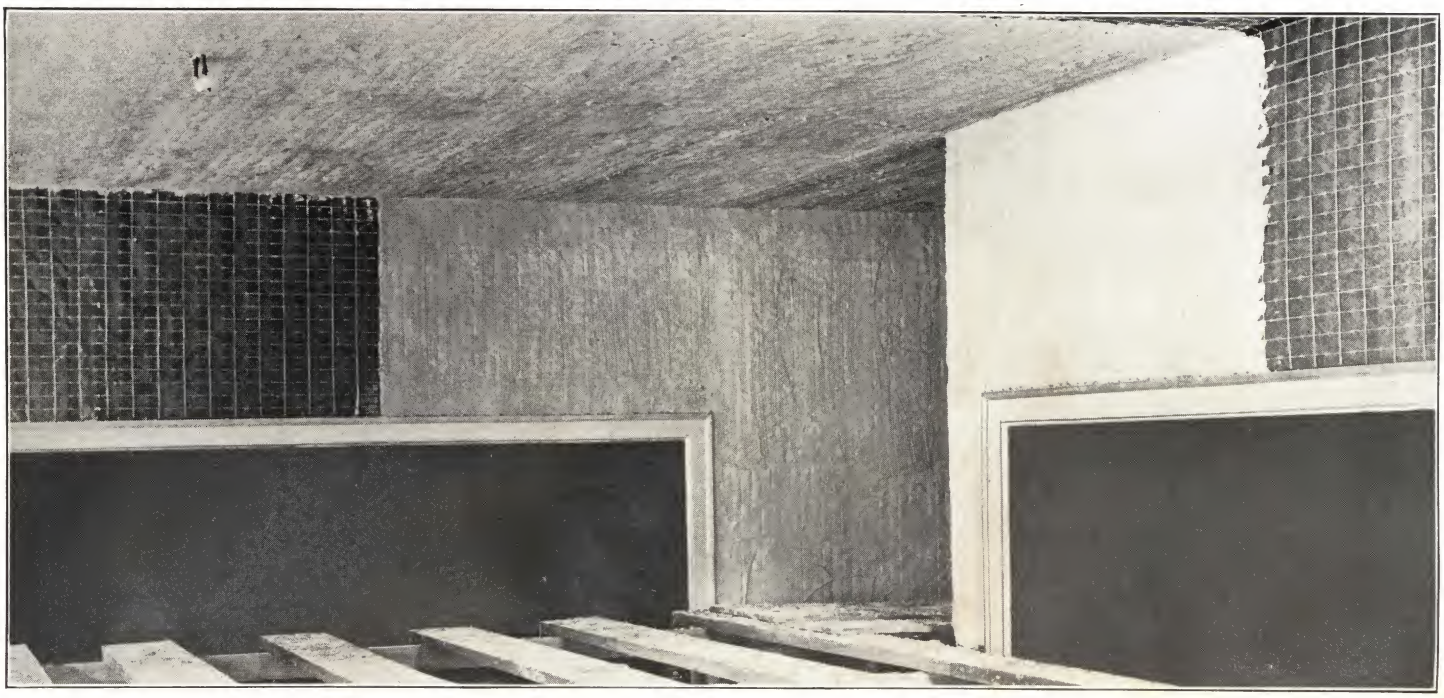
For economic reasons, therefore, it is essentially necessary to "reinforce" the plaster with steel; that is, to add the tensile strength necessary to withstand these outside forces.

If a slab of plaster, similar to that ordinarily used on walls and ceilings, could be suspended in the air where it would not be subjected to exterior forces, the necessity for reinforcing would not exist.

Consequently in order to insure *permanent* interior plaster walls and ceilings, the causes of "exterior forces" must be eliminated and, furthermore, tensile strength (through steel reinforcement) must be added to the material.

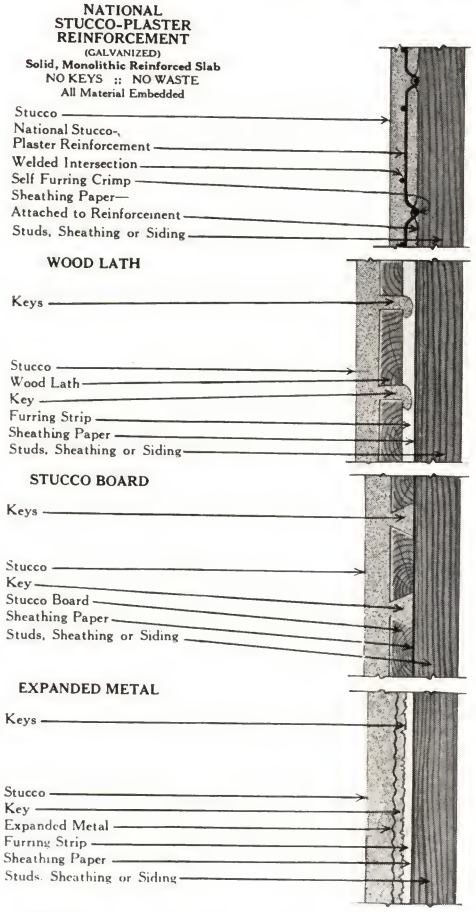
National Stucco-Plaster Reinforcement is the only material that performs the combined functions of a lath (yet is not a lath) and of a reinforcement.

The cost of National Stucco-Plaster Reinforcement per room completely plastered, is but little greater than the cost of ordinary but none-the-less primitive and inferior wood lath construction.



Plaster Walls and Ceilings of Class Room in Charleroi (Pa.) Public School, Reinforced with National Stucco-Plaster Reinforcement. Vernon Brooks, Monongahela City, Pa., Lather; Chas. Ebert, Charleroi, Pa., Plasterer.

Based on the Standard Specification for Magnesite Stucco; namely, ½" Over the Face of the Lath.

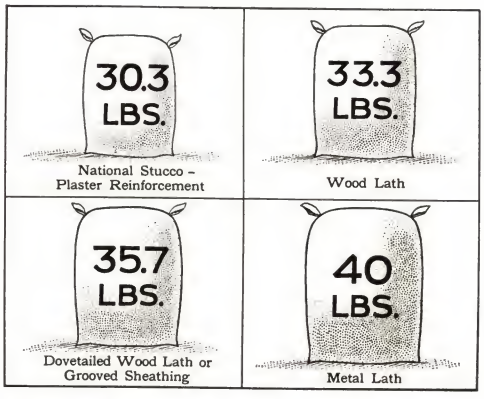


NATIONAL STUCCO-PLASTER REINFORCEMENT	COST OF STUCCO PER SQ. YD.	
One ton of Magnesite Stucco will cover on National Stucco-Plaster Reinforcement 66 yds. @ $50 per ton.	on National Stucco-Plaster Reinforcement	75.7c
		75.7c
WOOD LATH		
One ton of Magnesite Stucco will cover on Wood Lath approx. 60 yds. @ $50 per ton.	on Wood Lath	83.3c
Cost, on National Stucco-Plaster Reinforcement		75.7c
Saving, over Cost on Wood Lath		7.6c
STUCCO BOARD		
One ton of Magnesite Stucco will cover on Stucco Board approx. 56 yds. @ $50 per ton.	on Stucco Board	89.3c
Cost, on National Stucco-Plaster Reinforcement		75.7c
Saving, over Cost on Stucco Board		13.6c
EXPANDED METAL		
One ton of Magnesite Stucco will cover on Expanded Metal approx. 50 yds. @ $50 per ton.	on Expanded Metal	100.0c
Cost, on National Stucco-Plaster Reinforcement		75.7c
Saving, over Cost on Expanded Metal		24.3c

NOTE: The various manufacturers of Stucco claim different covering capacities for their products—the figures used above are based on an average covering capacity at an average per ton price.

Comparative Cost of Material

For comparative data on Cement Stucco, simply figure your own costs (based on the standard specification of ⅞" of material over the face of the lath) and substitute them for the Magnesite Stucco costs shown. In every case, you will find that a saving will be effected by the use of National Stucco-Plaster Reinforcement.
Write us, or any cement company or association for approved specifications for mixing and applying Portland Cement Stucco.



Amount of Stucco ½" Thick Required per Square Yard of Wall Surface

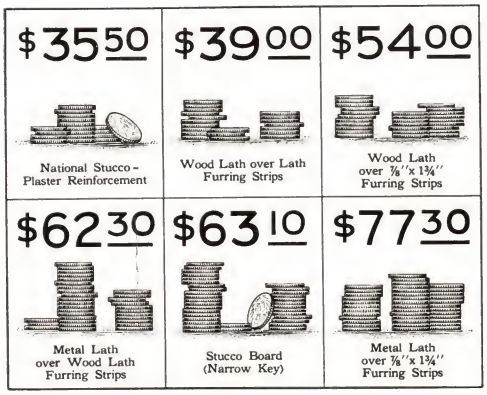
As the Average House has about 250 Square Yards of Exterior Wall, you can Readily see that National Stucco-Plaster Reinforcement Effects a Big Saving in Stucco Alone.



All Exterior Walls of "Wildwood Manor", This Five-Story Hotel at Wildwood, N. J., are covered with Stucco *Reinforced* with National Stucco-Plaster Reinforcement. Magaziner, Eberhard and Harris, Philadelphia, Pa., Architects.

Comparative Cost of Lath and Material

For comparative data on Cement Stucco, simply figure your own costs (based on the standard specification of 7/8" of material over the face of the lath) and substitute them for the Magnesite Stucco costs shown. In every case, you will find that a saving will be effected by the use of National Stucco-Plaster Reinforcement.
Write us, or any cement company or association for approved specifications for mixing and applying Portland Cement Stucco.



Comparative Cost of Lath and Material per 100 Square Yards of Surface

A Graphic Comparison of the Costs of National Stucco-Plaster Reinforcement and Other Materials.

1. Wood Lath, Applied over 7/8" x 1 3/4" Furring Strips. (It requires 9' of furring placed on 12" centers.)

9' Furring @ 2c linear foot	$.18
Labor to apply	.05
1 sq. yd. water proof building paper applied	.06
17 wood lath @ $10 per M	.17
10% material wasted in keys, magnesite @ $50 per ton	.08
Total	$.54 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-214.	$.38 Saving $.16 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-414.	.35½ Saving 185 yd.

* * * * * * *

2. Wood Lath, Applied over Lath as Furring. (It requires 3 lath for furring on 12" centers.)

3 Lath @ $10 per M	$.03
Labor to apply	.05
1 sq. yd. water proof building paper applied	.06
17 wood lath @ $10 per M	.17
10% material wasted in keys magnesite at $50 per ton	.08
Total	$.39 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-214.	$.38 Saving $.01 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-414.	.35½ Saving 035 yd.

* * * * * * *

3. Stucco Board (narrow key).

1 yd. Stucco board @ $55 M Sq. Ft.	$.495
15% material wasted in keys, magnesite at $50 per ton	.136
Total	$.631 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-214.	$.38 Saving $.251 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-414.	.35½ Saving 276 yd.

* * * * * * *

4. Metal Lath, Applied over 7/8" x 1 3/4" Furring Strips. (It requires 9' of furring placed on 12" centers.)

9' Furring @ 2c linear foot	$.18
Labor to apply	.05
1 sq. yd. water proof building paper applied	.06
1 yd. 24 ga. expanded metal	.24
25% material wasted in keys, magnesite at $50 per ton	.243
Total	$.773
1 yd. National Stucco-Plaster Reinforcement Style P-214.	$.38 Saving $.393 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-414.	.35½ Saving 418 yd.

* * * * * * *

5. Metal Lath, Applied over Wood Lath as Furring Strips. (It requires 3 lath for furring on 12" centers.)

3 Lath @ $10 per M	$.03
Labor to apply	.05
1 sq. yd. water proof building paper applied	.06
1 yd. 24 ga. expanded metal	.24
25% material wasted in keys, magnesite @ $50 per ton	.243
Total	$.623
1 yd. National Stucco-Plaster Reinforcement Style P-214.	$.38 Saving $.243 yd.
1 yd. National Stucco-Plaster Reinforcement Style P-414.	.35½ Saving 268 yd.

The foregoing figures represent *approximate* cost of various types of bases, ready to receive a stucco exterior. If these figures do not comply with your local costs, simply substitute your own. In any event, you will find that a saving will be effected by the use of National Stucco-Plaster Reinforcement.



LEFT—The Chas. S. Clark Residence and Garage, Oak Park, Illinois, in Process of Remodeling. Lowe and Bollenbacher, Chicago, Architects for Remodeling; Wm. Balhatchett & Co., Chicago, Plaster Contractors. RIGHT—The Same Residence and Garage After Remodeling in National Stucco-Plaster Reinforced Cement Stucco.

To the Owner

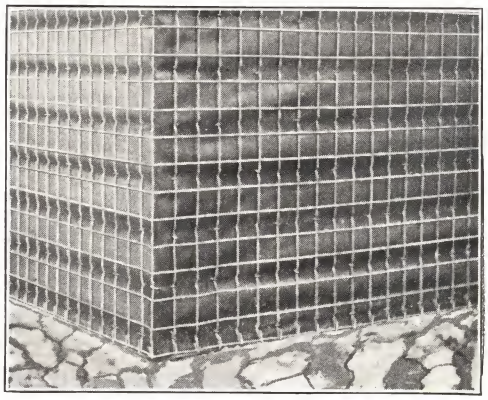
THE average individual who builds a home, builds but once in a lifetime. Therefore it behooves him to know something about the materials that go into its construction.

We contend that a *Reinforced* Stucco house provides unlimited opportunity for individual and artistic effects; that it provides permanent and wind proof and weather proof walls, a dry interior, and a fire resistant exterior, at a cost considerably less than even brick veneer and but little more than frame construction.

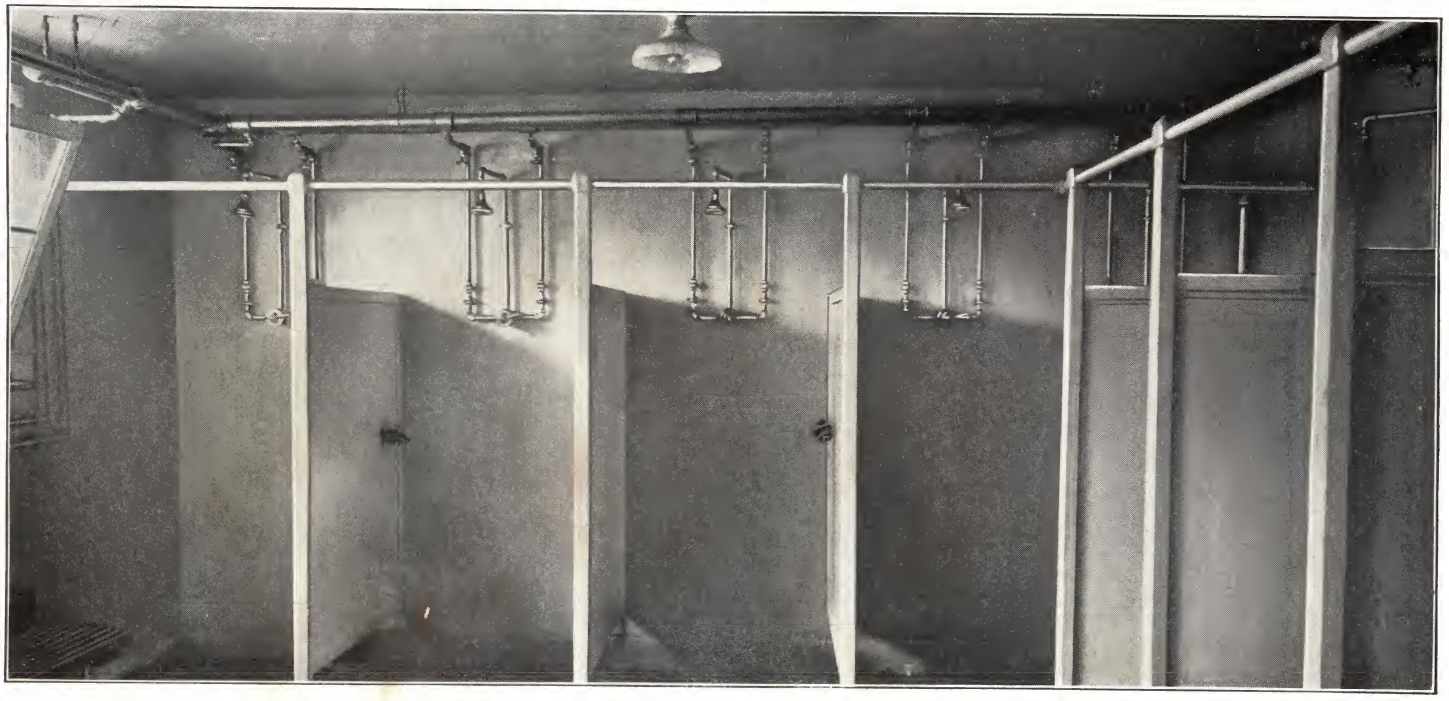
We contend, further, that you should also *reinforce* your interior plaster ceilings and walls. While the cost will average a very little more per room than ordinary but none-the-less inferior "key" type of wood lath construction, the extra investment is well worth while. Lath marks, rust marks, and cracked and falling plaster are *not* necessary evils—they really are indications of poor construction; you can obviate all of these evils by *reinforcing* your plaster with National Stucco-Plaster Reinforcement.

Finally you should use National Stucco-Plaster Reinforcement for all walls and ceilings because it automatically insures sufficient grounds (the proper thickness of stucco or plaster) to insure a permanent job. The manufacturers recommend respectively minimum thicknesses (over the face of the lath) of ½″ of magnesite stucco, ⅝″ of interior plaster, and ⅞″ of cement stucco—a *permanent* job cannot be assured if less is used; the unique (patented) furring crimps in National Stucco-Plaster Reinforcement make it practically impossible for the plasterer to "skin" the job and use less than ½″ of material.

Tell your Architect, Contractor, and Plasterer that you insist on *reinforced* walls and ceilings.



When National Stucco-Plaster Reinforcement is Applied in Accordance with Our Specifications, the Corners will be Just as Strong as Any Other Part of the Wall or Ceiling.



Shower Room of the Stanton Heights Golf Club, Pittsburgh, Pa. This puts National Stucco-Plaster Reinforcement to an Extreme Test. The Moisture Laden Air and Constantly Changing Temperature in this Room would Soon Ruin the Best Job of "Key" Construction.

To the Architect

NATIONAL Stucco-Plaster Reinforcement is a true reinforcement and base for stucco exteriors, interior walls and ceilings, wainscotting, tile mantels, floors and roofs. It is applicable to all types of building construction—homes, office buildings, factories, apartments, garages, gasoline filling stations and public buildings.

The details of the construction of National Stucco-Plaster Reinforcement are explained on page 5 of this book. Recommended specifications are on page 16. Sections on opposite page.

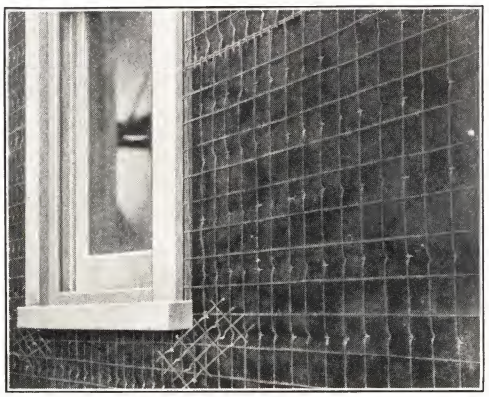
In view of the fact that Stucco or Plaster is moist when applied, a slight change in volume occurs as the moisture dries out. For this reason, the American Concrete Institute, Committee on Treatment of Concrete Surfaces, says:

> "The ideal job of lathing would obviously be that in which the lath forms a uniform fabric over the structure, without seams or lines of weakness, and *with equal reinforcing value in all directions*."

National Stucco-Plaster Reinforcement has equal reinforcing value in all directions; it equalizes the stresses engendered in the stucco or plaster slab during the periods of expansion and contraction, and thereby prevents cracking. The fact that the Plaster or Stucco completely surrounds the wires precludes any possibility of the material falling off, as is common in "key" types of construction.

All in all—National Stucco-Plaster Reinforcement recommends itself to you in so many ways that it is worth your while to look into it thoroughly. Those who have already passed upon this product recommend it unhesitatingly.

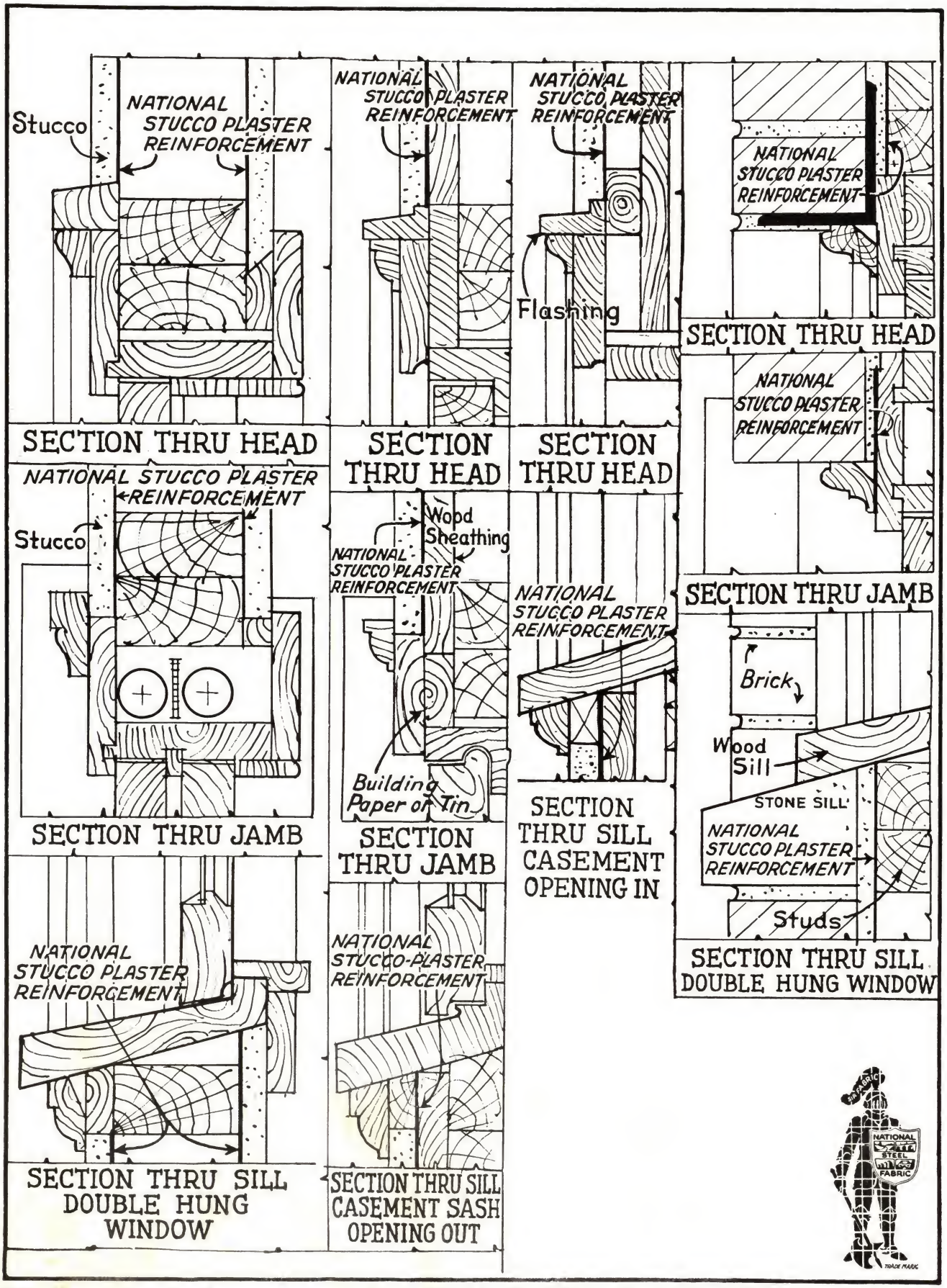
Samples will be mailed to you upon request.



For New or Overcoat Work, National Stucco-Plaster Reinforcement Obviates the Necessity for Special (or, at Least, Specially Designed) Window and Door Frames or Moulding. (Note Recommended Method of Doubly Reinforcing Corners of Window Frames—Usually the Weakest Points of the Building.)



Stucco House at Great Neck, Long Island, N. Y., *Reinforced* with National Stucco-Plaster Reinforcement. Oswald C. Hering and Douglas Fitch, New York City, Associate Architects. Roberts, Nash & Co., Flushing, Long Island, Contractors.



Window details for use with NATIONAL STUCCO-PLASTER REINFORCEMENT

Recommended Specification

ALL exterior walls shall be lathed with National Stucco-Plaster Reinforcement, Style No._____, and all interior walls, partitions and ceilings to be lathed with National Stucco-Plaster Reinforcement, Style No._____, securely fastened to the supports in such a way that the length of the sheets shall be placed at right angles to studs, joists or other supports. All Reinforcement shall be securely stapled or wired to the supports, starting at the center of the sheet whenever possible, and working out towards the ends.

When applied over wood sheathing, it shall be applied with the crimps facing the sheathing and stapled with a one-inch galvanized staple, every 16″ longitudinally and every 6″ transversely.

When applied to wooden supports, the Reinforcement shall be securely stapled, at least every six inches along the supports, with a one-inch 14 gauge galvanized wire staple.

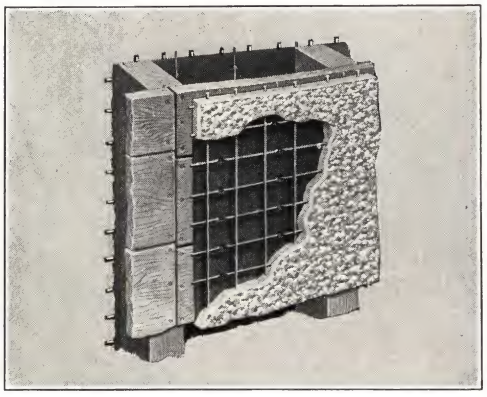
When applied to metal supports, the Reinforcement shall be tied thereto by No. 16 gauge galvanized wire, at least every six inches along the supports.

All laps shall be made by overlapping the face of the Reinforcement one inch, as provided for in the manufacture. In no case shall the sheets of the Reinforcement be butted or shall the paper extend over the face of the Reinforcement.

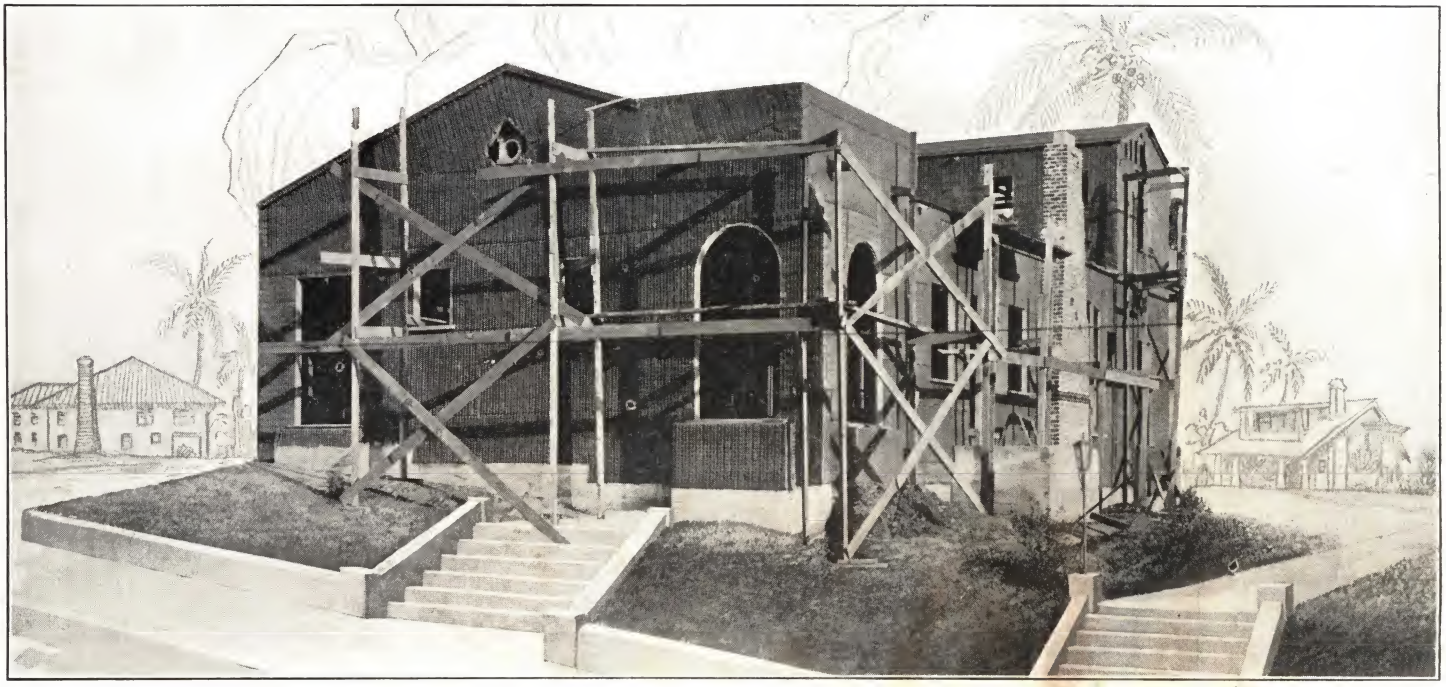
All laps shall be securely stapled in each and every wire or securely laced with a No. 16 gauge galvanized wire.

All corners, either interior or exterior, shall be made by bending the Reinforcement around the corner, so that it overlaps the connecting walls not less than sixteen inches.

When applied direct to studs, the sheets shall extend at least to the first stud on connecting walls. In no case shall a joint be made between studs.



Showing How National Stucco-Plaster Reinforcement is Applied Over Wood Sheathing or Insulation.



National Stucco-Plaster Reinforced Cement Stucco Residence at 2026 N. Berendo Street, Los Angeles, California. Ray W. Baker, Builder. Walter W. Bray, Plaster Contractor.

To the Contractor and the Plasterer

NATIONAL Stucco-Plaster Reinforcement is not a substitute for plaster, but a *galvanized reinforcement* and base for exterior stucco and interior plaster and is not a finished job until the plasterer has completed his work.

Does it mean anything to know that you can work faster and obtain a better and more permanent job? National Stucco-Plaster Reinforcement will do this.

The 2″ x 2″ or 2″ x 4″ mesh of the electrically welded galvanized steel wires makes it much easier to spread the plastic material and there are no "keys" that require extra pushing effort.

The crimps in the horizontal wires make it self furring.

The cost of back-plastering is eliminated, because the galvanized 14 gauge cold drawn welded steel wires of National Stucco-Plaster Reinforcement automatically become an integral part of and thoroughly embedded when the plaster or stucco is applied against the tough paper backing.

This paper backing is water proof; therefore there is no danger that the moisture will be absorbed before the "hard set" takes place. This is an important factor in stucco and plaster work because, if absorbed by the base or lath, there would not be sufficient moisture to permit crystallization and the result would be a soft and crumbly wall.

The rigid paper backing also provides a "form" against which the stucco or plaster can be "packed" with trowel and darby, making the first coat of the same density as the last, and providing against unequal shrinkage and consequent cracking of the finished walls—in short, assuring a more uniform, dense, and water proof slab.

You cannot, however, use a poor or lean mix over National Stucco-Plaster Reinforcement, neither is it possible to cover it with less than a total of ½″ of Plaster or Stucco.

National Stucco-Plaster Reinforcement assures permanent construction at a lower cost.

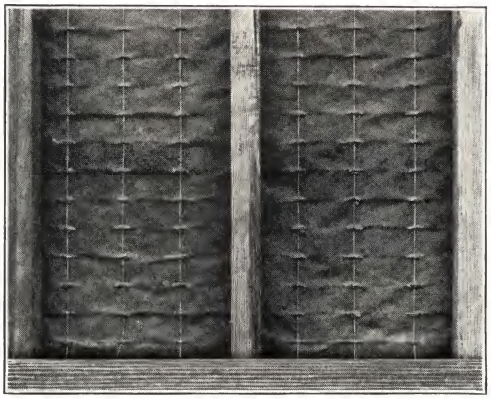


Applying the Scratch Coat. The Cohesion of the Moist Stucco (or Plaster) to the Dry Water Proof Paper Backing of National Stucco-Plaster Reinforcement Obviates the Necessity for "Keys" and Thereby Saves from 10% to 25% of the Stucco (or Plaster).



National Stucco-Plaster Reinforced Residence and Garage in Southland Parks, Fla. Stiles C. Hall, Builder, West Palm Beach, Fla.

To the Realty Dealer and Investment Builder



The Back Side of a National Stucco-Plaster Reinforced Cement Stucco Wall. Applied Direct to the Studs, this *Reinforced, Monolithic* Wall (with National Stucco-Plaster Reinforcement Thoroughly Embedded) is Immeasurably Stronger than the Weak, *Ineffective* "Key" Type of Construction.

THE problems of the Realty Dealer and Investment Builder, whose business it is to build houses for re-sale, are greatly simplified when National Stucco-Plaster Reinforcement is used.

By using this material on walls and ceilings, both interior and exterior, not only is a stronger and more durable job obtained, but a great saving in cost is effected.

1. It Eliminates Necessity of Sheathing—

The combination of electrically welded *galvanized* wires and the water-proof paper backing provides a rigid background for plaster and stucco. The *galvanized* wires which become embedded in the material, form a reinforced slab which eliminates the necessity of wood sheathing.

2. It Eliminates Separate Building Paper—

The heavy water proof paper backing serves to hold the plastic material in place until set and afterwards acts as a sound and weather resistant, thereby eliminating separate building paper.

3. It is Self Furring—

The crimps in the horizontal wires hold the reinforcement approximately ¼" from the studding and paper backing, and thereby make it self furring.

4. It Takes the Place of "Key" Type Lath—

Last, but not least, National Stucco-Plaster Reinforcement serves in place of lath. It becomes thoroughly embedded in the material, and not only holds it to the wall but also *reinforces* it, making it lasting and permanent.

National Stucco-Plaster Reinforcement is the ideal material for Realty Dealers and Investment Builders because it saves material, time, and labor, and assures permanent construction free from lath marks, rust marks, cracking and final failure.



A Group of Some of the National Stucco-Plaster Reinforced Cement Stucco Homes in the Kansas City Country Club District Development. J. C. Nichols Investment Co., Operators; Edw. W. Tanner, Architect; H. Stanley Hill, Plaster Contractor, all of Kansas City, Mo.

The Advantages of National Stucco-Plaster Reinforcement

1. It is easy to apply; because the paper backing is a part of and is securely fastened to the fabric, and because it is self furring (note the self furring crimps), National Stucco-Plaster Reinforcement can be applied very much more quickly than ordinary wood, metal, and wire laths or bases requiring separate building paper and furring strips.

2. It is galvanized; neither the liquids used in the patented stuccos, nor the water used in the cement plasters have any noticeable effect on the No. 14 gauge galvanized wires used in the construction of National Stucco-Plaster Reinforcement.

3. It eliminates "keys"; keys are that quantity of stucco or plaster forced through the openings provided in the lath or base in order to hold in place, *over the face of the base*, the specified amount of plastic material.

Keys, therefore, add nothing to the strength of the stucco or plaster slab, and the quantity of plastic material used to form keys is actually wasted.

In view of the fact that capillary attraction will cause the plastic material to cling unsupported to a dry surface, it is safe to assume that it will do 75% of the work which ordinary bases are designed to accomplish—therefore, there is a positive waste of 75% of the material entering into the construction of ordinary bases.

4. It gives a reinforced monolithic slab; National Stucco-Plaster Reinforcement, which developes a tensile strength of more than 60,000 lbs. per square inch of steel, becomes an integral part of and thoroughly embedded in the slab; it reinforces the slab on the same principle and for the same reason that the greater portion of concrete used today is reinforced with steel.

5. It saves one entire operation; the galvanized, electric welded, cold drawn steel wire fabric *reinforcement* and an extremely tough and heavy water proof paper backing form a *single material*, which is made in 4′ x 8′ sheets to speed up application and to effect additional savings in time and labor costs.

6. Special window and door frames or moulding are unnecessary; most "key" type laths or bases must be "furred" away from the studs or sheathing—otherwise the keys could not be formed. As the base and the furring will take up ½″ at the minimum, the face of a slab applied ½″ *over the face* of such a base (in accordance with standard specifications) will be at least 1″ from the face of the studs or sheathing; special or at least specially placed window and door frames, or special moulding, are therefore usually required. These are unnecessary when National Stucco-Plaster Reinforcement is used, because the face of a ½″ slab applied thereon is exactly ½″ from the face of studs or sheathing.

7. It is as easy to work over as wood lath; to work over National Stucco-Plaster Reinforcement requires no more knack than does working over wood lath—in fact, the scratch coat can be applied over National Stucco-Plaster Reinforcement very much more quickly, in view of the fact that the plastic material does not have to be forced into openings, in order to form "keys," as is the case with wood lath.

8. It automatically insures sufficient "grounds" (the proper thickness of material) to give a serviceable and lasting job; this is due to the self furring crimps which space the fabric a uniform distance from the background.

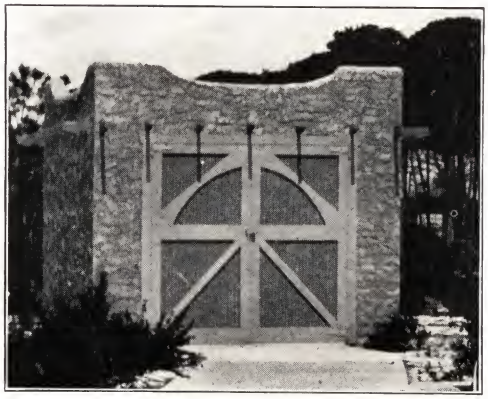
9. It costs no more in place than ordinary metal, wire, wood lath, or stucco board bases; this statement is probably too conservative—figuring the cost of furring and furring strips, water proof building paper, the time required to force the material into bases in order to form keys, plus the cost of material wasted in the nature of keys, actually makes National Stucco-Plaster Reinforcement, in place, much cheaper than even wood lath in place.

10. National Stucco-Plaster Reinforcement saves time, labor and material, and assures a permanent job.



The Schmullen Residence, Magnolia Drive and Deep Dale Drive, Great Neck, Long Island, N. Y. Architect, George Barnes, Great Neck. Builders and Plasterers, Lunklater Construction Co. Magnesite Stucco *Reinforced* with National Stucco-Plaster Reinforcement.

National One Car Garage



National Garage Plans can be Altered to Correspond with the Architecture of the House. See Illustration on Page 17.

QUANTITY MATERIAL SURVEY

National One Car Garage 10′ wide x 10′ high x 18′ deep or 20′ deep

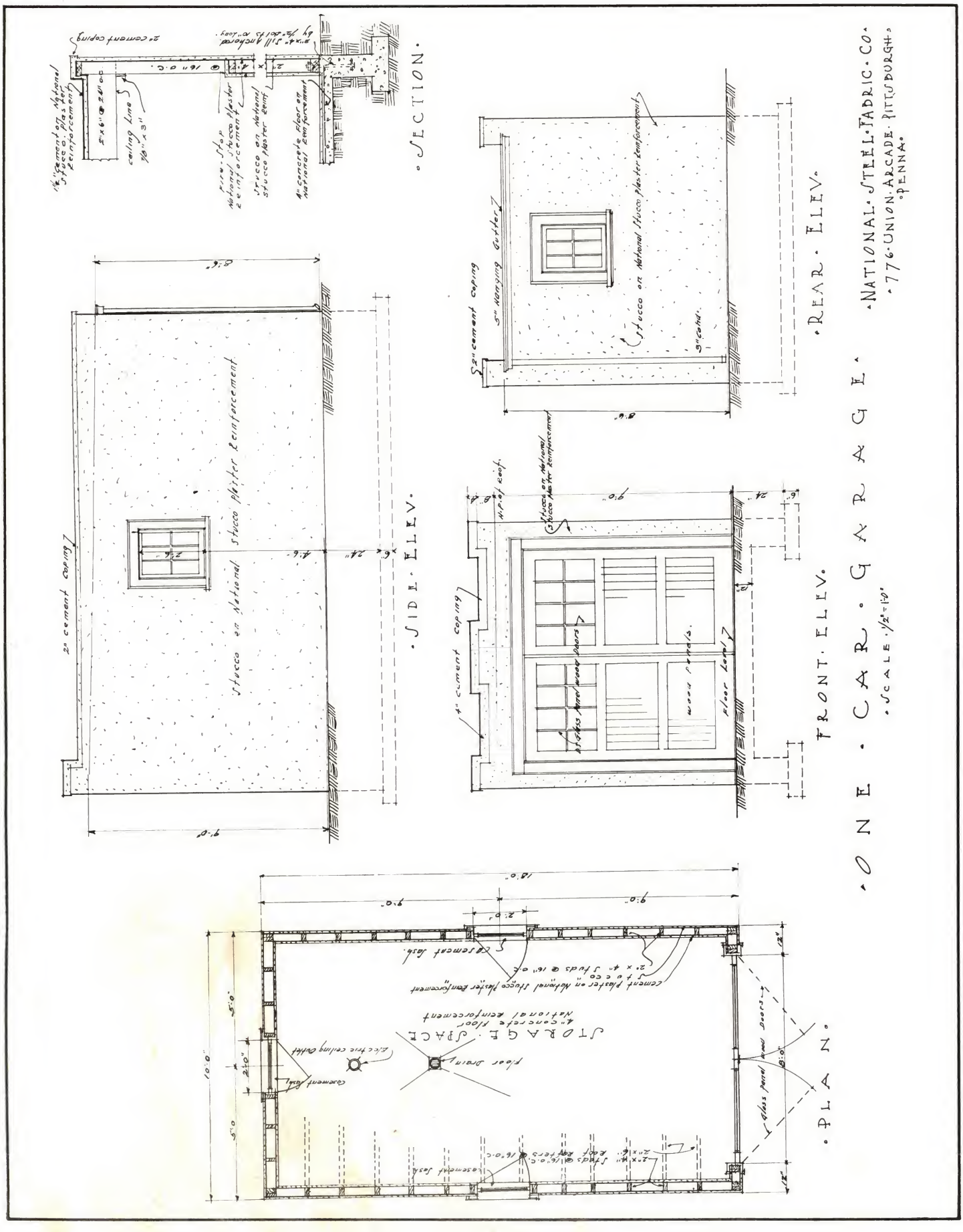
(*See plan on page 21*)

Description	Quantities 18′ Garage	Quantities 20′ Garage
Rough Lumber		
2 x 4—10′ Long—Studding	42 Pcs.	46 Pcs.
2 x 6—10′ Long—Roof Rafters	14 Pcs.	18 Pcs.
2 x 4—10′ Long—Sills	6 Pcs.	6 Pcs.
2 x 4—10′ Long—Fire Stops	5 Pcs.	5 Pcs.
2 x 4—10′ Long—Plates	5 Pcs.	5 Pcs.
⅞ x 3—10′ Long—Ridge Bd. Material	5 Pcs.	5 Pcs.
Mill Work		
Stock Casement Frames, Sash 6 Lts. 8 x 12 Gl. DS. (AA)	3	3
Stock Garage Door Frame, 6″ Mullion, 8′ 0″ x 8′ 0″ W. P.	1	1
Stock Garage Doors, W. P. 1¾″ x 4′ 0″ x 8′ 0″. 2 Bottom panels, Top 8 Lts. 9″ x 12″ Gl. DS. (AA)	2	2
Concrete Work		
Concrete Footings (1 part Portland Cement, 2½ Parts clean sand, 5 parts gravel)	5⅓ Cu.Yd.	5⅝ Cu.Yd.
Concrete Floor (1 part Portland Cement, 2 parts clean sharp sand, 6 parts Boiler House Cinders)	1⅔ Cu.Yd.	2 Cu.Yd.
Cement Coping (1 part sand, 1 part Portland Cement)	⅜ Cu.Yd.	½ Cu.Yd.
Cement on Roof (1 part sand, 1 part Portland Cement)	1 Cu.Yd.	1⅓ Cu.Yd.
Tin Work		
5″ round ½ Hanging Gutter	8 Feet	8 Feet
3″ Corrugated Conductor	9 Feet	9 Feet
Roof		
4 Ply Slag Roofing. (Any approved Brand)	200 Sq. Ft.	200 Sq. Ft.
Hardware		
Bolts ½″ x 10″—Sill Anchors	5	5
Standard Garage Hinges	2 Sets	2 Sets
Standard Garage Latches and Locks	1 Set	1 Set
4″ x 4″ Bell Trap	1	1
National Stucco-Plaster Reinforcement		
Outside Walls, Style P-214	55 Sq.Yd.	60 Sq.Yd.
Roof, Style P-214	20 Sq.Yd.	25 Sq.Yd.
Fire Wall, Style P-214	22 Sq.Yd.	24 Sq.Yd.
National Steel Fabric Reinforcement		
Floor, Style CC-1010	17 Sq.Yd.	21 Sq.Yd.
Stucco		
Outside Walls	55 Sq.Yd.	60 Sq.Yd.
Plaster		
Fire Wall	22 Sq.Yd.	24 Sq.Yd.
Excavations		
According to plans	8 Cu.Yd.	9 Cu.Yd.

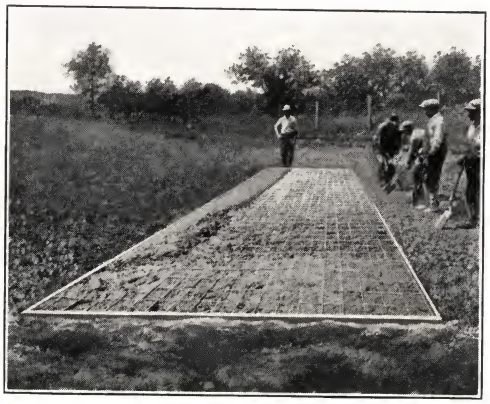
Plumbing, wiring, and painting are extra



National Garages are Permanent, as well as Architecturally Pleasing, and can be Built for About the Same Initial Cost as Frame Garages


·ONE·CAR·GARAGE·
·NATIONAL·STEEL·FABRIC·CO·
·776·UNION·ARCADE·PITTSBURGH·
·PENNA·
·SECTION·
·SIDE·ELEV·
·REAR·ELEV·
·FRONT·ELEV·
·SCALE·1/2"=1'-0"
·PLAN·
STORAGE·SPACE
4" concrete floor
National reinforcement
floor drain
electric ceiling outlet
casement sash
glass panel wood doors
cement plaster on National stucco plaster reinforcement
2" x 4" joists @ 16" o.c.
cement slab
2" x 6" roof rafters @ 16" o.c.
2" cement coping
stucco on National stucco plaster reinforcement
floor level
wood panels
glass panel wood doors
4" concrete floor on National reinforcement
16" o.c.
2" x 4" sill anchored by 3/8" bolts 10" long
2" cement coping
16" o.c.
ceiling line
2" x 6"
2" x 8"
3" x 3"
16" o.c.
1/4" cement on National stucco plaster reinforcement
2" cement coping
stucco on National stucco plaster reinforcement
2" x 4" sill anchored by 3/8" bolts 10" long
4" concrete floor on National reinforcement
stucco on National stucco plaster reinforcement
2" cement coping
3" sloping gutter
stucco on National stucco plaster reinforcement
3" coke
8'-6"
9'-0"
24"
6"
4'-6"
2'-6"
4'-6"
24"
6"
9'-0"
24"
6"
4'-6"
2'-6"
9'-0"
16'-0"
9'-0"
2'-0"
5'-0"
2'-10"
5'-0"
10'-0"

National Two Car Garage



This Illustration Shows the Method of *Reinforcing* National Garage Floors against Cracking. National Steel Fabric is used for this purpose; see page 24.

QUANTITY MATERIAL SURVEY

National Two Car Garage, 18′ wide x 10′ high x 18′ deep or 20′ deep

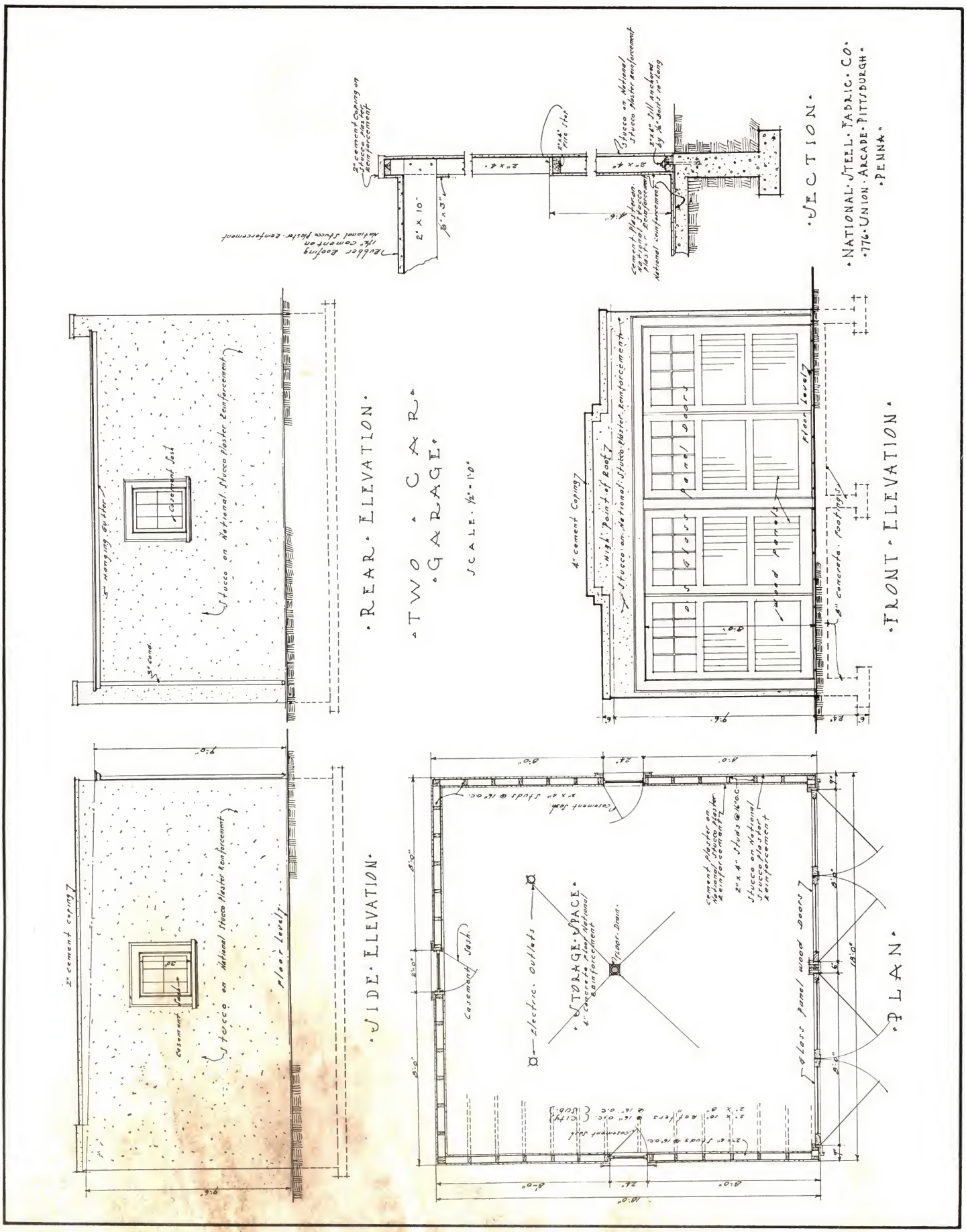
(*See plan on page 23*)

Description	Quantities 18′ Garage		Quantities 20′ Garage	
Rough Lumber				
2 x 4—10′ Long—Studding	54	Pcs.	58	Pcs.
2 x 10—18′ Long—Roof Rafters	14	Pcs.	16	Pcs.
2 x 10—18′ Long—Sills	4	Pcs.	8	Pcs.
2 x 4—9′ Long—Fire Stops	8	Pcs.	9	Pcs.
2 x 4—9′ Long—Plates	8	Pcs.	9	Pcs.
⅞ x 3—9′ Long—Roof Rafter Supports	8	Pcs.	9	Pcs.
Mill Work				
Stock Casement Frames, Sash 6 Lts. 8 x 12 Gl. DS. (AA)	3		3	
Stock Garage Door Frame, 6″ Mullion, 16′ 0″ x 8′ 0″ W.P.	1		1	
Stock Garage Doors, W.P. 1¾″ x 4′ 0″ x 8′ 0″. 2 Bottom Panels Top 8 Lts. 9″x12″ Gl. DS. (AA)	4		4	
Concrete Work				
Concrete Footings (1 part Portland Cement 2½ parts clean sharp sand 5 parts gravel)	7	Cu.Yd.	7½	Cu.Yd.
Concrete Floor (1 part Portland Cement 2 parts clean sharp sand 6 parts Boiler House Cinders)	3½	Cu.Yd.	4	Cu.Yd.
Cement Coping (1 part sand 1 part Portland Cement)	⅛	Cu.Yd.	1	Cu.Yd.
Cement on Roof (1 part sand 1 part Portland Cement)	2	Cu.Yd.	2⅛	Cu.Yd.
Tin Work				
5″ Round ½ Hanging Gutter	16	Feet	16	Feet
3″ Corrugated Conductor	9	Feet	9	Feet
Roof				
4 Ply Slag Roofing. (Any approved Brand)	400	Sq.Ft.	400	Sq.Ft.
Hardware				
Bolts ½″ x 10″—Sill Anchors	10		10	
Standard Garage Hinges	4	Sets	4	Sets
Standard Garage Latches and Locks	2	Sets	2	Sets
4″ x 4″ Bell Trap	1		1	
National Stucco-Plaster Reinforcement				
Outside Walls, Style P-214	65	Sq.Yd.	70	Sq.Yd.
Roof, Style P-214	40	Sq.Yd.	45	Sq.Yd.
Fire Wall, Style P-214	27	Sq.Yd.	29	Sq.Yd.
National Steel Fabric Reinforcement				
Floor, Style CC-1010	32	Sq.Yd.	36	Sq.Yd.
Stucco				
Outside Walls	65	Sq.Yd.	70	Sq.Yd.
Plaster				
Fire Wall	27	Sq.Yd.	29	Sq.Yd.
Excavations				
According to plans	10	Cu.Yd.	11	Cu.Yd.

Plumbing, wiring, and painting are extra



A National Two Car Garage is Always a Good Investment when Building Space is Available. When not Put to Private Use, One-Half can be Rented, and Thus Made to Pay a Worth-While Income.


• NATIONAL STEEL FABRIC CO.
• 176 UNION ARCADE PITTSBURGH
• PENNA.
• SECTION.
• FRONT ELEVATION.
• REAR ELEVATION.
• SIDE ELEVATION.
• PLAN.
• TWO CAR
• GARAGE.
SCALE. ½" = 1'-0"
Stucco on National Stucco Plaster Reinforcement
4" cement Coping
Floor Level
Concrete footings
Casement Sash
Electric outlets
STORAGE SPACE
4" Concrete Floor National Reinforcement
Floor Drain
Cement plaster on National Reinforcement
Stucco on National Stucco Plaster Reinforcement
Plain panel wood doors

NATIONAL BUILDING FABRIC

NATIONAL Steel Fabric is an electrically welded fabric of cold drawn steel wires, made in various gauges and spacings of wires. It is peculiarly suitable and especially designed for reinforcing the concrete foundations, floors, roofs, and walls of buildings, warehouses, garages, etc.; for cement gun work of all kinds; for reinforcing cement and gypsum roofs, concrete pipe, driveways and sidewalks, reservoirs, levees, revetments, oil and water tanks, etc., as well as for beam wrapping, and for fireproofing the steel framework of bridges, buildings, etc.



Furnished in Rolls or Sheets

The fabric is manufactured from a very high-grade cold drawn steel wire which develops a tensile strength of 60,000 to 85,000 pounds per square inch; the material will bend, cold, 180 degrees around one diameter without fracture.

The welding or more properly, the *fusing* of the transverse wires to the longitudinal wires is accomplished by means of electricity. Exhaustive tests have proven that the welding process does not have a weakening effect upon the fabric, either longitudinally or transversely; in fact, tensile tests upon individual wires taken from pieces of fabric prove the weld to be the strongest part of the wire. (*)

The advantages of National Steel Fabric over bar reinforcing of an equal cross-sectional area are obvious; in the first place, the fabric is infinitely easier and cheaper to handle and to place; in the second place, the wires of the fabric have much better physical properties than hot rolled bars.

This is not hard to understand. The process of cold drawing increases the density of the steel by decreasing the size of the crystals of which steel is composed, thereby adding tremendously to its tensile strength and yield point.

Because the yield point of cold drawn wire is at least 50% greater than that of hot rolled bars of equal cross-sectional area, the efficiency of National Steel Fabric is at least 50% greater than an equal area of hot rolled bar reinforcement.

Because of the greater bonding area, the tensile strength of the steel in a welded fabric is more fully developed in the concrete than is possible when bars are used. For example, four No. 3 wires have an area of .1866 square inch and a total circumference or bonding surface of 3.06 inches, whereas a ½″ bar has about the same area but only 1.57 inches circumference or bonding surface.

When National Steel Fabric is used, the bond is further developed by reason of the fact that the transverse wires are securely welded to the longitudinal wires, at close intervals, which prevents slipping.

General practice in reinforced concrete construction limits the spacing of main steel members to the depth of the slab, or less, in order to get the best distribution of steel. In reinforced concrete road construction, for instance, this usually means a maximum spacing of 8″ for steel members placed perpendicular to the center line of the road, which makes the use of bars almost economically prohibitive.

Furthermore, loose bars or even hand-tied bars may assume almost any position in the slab before final set of the concrete, whereas the rigid, flat sheet of fabric is certain to remain in the position where originally placed.

National Steel Fabric is from 5% to 20% more "effective" than a woven wire fabric of the same total weight—because from 5% to 20% of the steel used in the manufacture of a woven wire fabric is wasted in ties or wraps, which are "ineffective" in resisting tensile stresses.

Another feature of National Steel Fabric is the fact that it can be furnished made up of wires having the same cross-sectional area in both directions—a woven fabric has certain limitations in this respect, due to the fact that only the lighter gauges of wire can be used for "weaving." Thus, National Steel Fabric obviates the necessity for laying two courses of reinforcement when the design requires equal cross-sectional area in both directions.

National Steel Fabric assures a more dense, perfectly bonded concrete, free of voids—this is due to the fact that the numerous small wires offer less resistance to the free flow of the aggregate than either bars or the "ties" of a woven fabric.

National Steel Fabric provides the greatest amount of strength for a given amount of steel, and, at the same time, minimizes the cost of transportation, handling, and placing the reinforcement.

(*) *Authoritative data and results of laboratory tests will be sent upon request.*

National Steel Fabric Standard Styles

For Buildings and Other Structures—Cement Gun Work, Beam Wrapping, Temperature Reinforcement, Canal Lining, Levee Work, Concrete Pipe, Etc.

Suggested Uses	Style	Spacing		Gauge of Wire		Sec. Area Sq. In. per Lin. Ft.		Weight per 100 Square Feet
		Long.	Tran.	Long.	Tran.	Long.	Tran.	
Cement Gun Work, Composition Floors, etc.	AA 1414	2″	2″	14	14	.030	.030	21.1
	AA 1212	2″	2″	12	12	.052	.052	36.8
	BB 1212	4″	4″	12	12	.026	.026	18.7
	BB 1010	4″	4″	10	10	.043	.043	30.6
Cement Gun Work, Levee Lining, etc.	BB 88	4″	4″	8	8	.062	.062	44.1
	BB 66	4″	4″	6	6	.087	.087	61.9
	BB 55	4″	4″	5	5	.101	.101	72.0
	BB 44	4″	4″	4	4	.120	.120	85.3
Temperature Reinforcement etc.	CC 1212	6″	6″	12	12	.017	.017	12.7
	CC 1111	6″	6″	11	11	.023	.023	16.5
	CC 1010	6″	6″	10	10	.029	.029	20.7
	CC 99	6″	6″	9	9	.035	.035	25.1
Slab Reinforcement, Fireproofing, Retaining Walls, etc.	BH 1212	4″	16″	12	12	.026	.007	11.8
	BH 1012	4″	16″	10	12	.043	.007	17.9
	BH 912	4″	16″	9	12	.052	.007	21.1
	BH 812	4″	16″	8	12	.062	.007	24.7
	BH 711	4″	16″	7	11	.074	.008	29.7
	BH 610	4″	16″	6	10	.087	.011	35.2
	BH 510	4″	16″	5	10	.101	.011	40.4
	BH 49	4″	16″	4	9	.120	.013	47.9
	BH 38	4″	16″	3	8	.140	.015	56.1
	BH 28	4″	16″	2	8	.162	.015	64.3
	BH 17	4″	16″	1	7	.189	.018	74.8
	BH 06	4″	16″	0	6	.221	.022	87.8
Slab Reinforcement, Fireproofing, Driveways and Walks, etc.	BF 1212	4″	12″	12	12	.026	.009	12.6
	BF 1112	4″	12″	11	12	.034	.009	15.5
	BF 1012	4″	12″	10	12	.043	.009	18.6
	BF 912	4″	12″	9	12	.052	.009	21.8
	BF 812	4″	12″	8	12	.062	.009	25.5
	BF 712	4″	12″	7	12	.074	.009	29.8
	BF 611	4″	12″	6	11	.087	.011	35.5
	BF 610	4″	12″	6	10	.087	.014	36.5
	BF 510	4″	12″	5	10	.101	.014	41.6
	BF 49	4″	12″	4	9	.120	.017	49.4
Beam Wrapping, Fireproofing, etc.	BD 1212	4″	8″	12	12	.026	.013	14.1
	BD 1112	4″	8″	11	12	.034	.013	17.0
	BD 1012	4″	8″	10	12	.043	.013	20.2
Concrete Pipe, etc.	BD 912	4″	8″	9	12	.052	.013	23.4
	BD 812	4″	8″	8	12	.062	.013	27.0
	BD 712	4″	8″	7	12	.074	.013	31.3
Slab Reinforcement, Fireproofing, etc.	TH 610	3″	16″	6	10	.116	.011	45.1
	TH 510	3″	16″	5	10	.135	.011	51.8
	TH 49	3″	16″	4	9	.160	.013	61.4
	TH 38	3″	16″	3	8	.187	.015	72.0
	TH 28	3″	16″	2	8	.217	.015	82.6
	TH 17	3″	16″	1	7	.252	.018	96.2
	TH 06	3″	16″	0	6	.295	.022	112.9

Furnished with plain or galvanized finish; unless ordered galvanized, plain wire will be furnished.

Width, 56″ or 60″ C-C outside main wires, 1″ overhang; total width, 58″ or 62″ for 4″ spacing of main wires.

Width, 54″ or 60″ C-C outside main wires, 1″ overhang; total width, 56″ or 62″ for 6″ spacing of main wires.

Length of rolls, 125 to 300 lineal feet depending on the weight of style selected. It is recommended that styles with longitudinal wires of No. 3 gauge or heavier be furnished in flat sheets.

Approximate Weights Per 100 Square Feet

LONGITUDINAL WIRES

Gauge of Wires	Center to Center Spacing of Longitudinal Wires in Inches						
	2″	3″	4″	5″	6″	10″	12″
6–0	352.22	238.60	181.79	147.71	124.98	79.53	68.17
5–0	306.47	207.61	158.18	128.52	108.75	69.20	59.32
4–0	256.43	173.71	132.35	107.54	90.99	57.90	49.63
3–0	217.31	147.21	112.16	91.13	77.11	49.07	42.06
2–0	181.16	122.72	93.50	75.97	64.28	40.91	35.06
0	155.37	105.25	80.19	65.16	55.13	35.08	30.07
1	132.43	89.71	68.35	55.54	46.99	29.90	25.63
2	113.96	77.20	58.82	47.79	40.44	25.73	22.06
3	98.21	66.53	50.69	41.18	34.85	22.18	19.01
4	83.95	56.87	43.33	35.20	29.79	18.96	16.25
5	70.87	48.01	36.58	29.72	25.15	16.00	13.72
6	60.96	41.29	31.46	25.56	21.63	13.76	11.80
7	51.81	35.10	26.74	21.73	18.38	11.70	10.03
8	43.40	29.40	22.40	18.20	15.40	9.80	8.40
9	36.37	24.64	18.77	15.25	12.91	8.21	7.04
10	30.14	20.42	15.56	12.64	10.69	6.81	5.83
11	24.01	16.27	12.39	10.07	8.52	5.42	4.65
12	18.41	12.47	9.50	7.72	6.53	4.16	3.56
13	13.84	9.38	7.15	5.81	4.91	3.13	2.68
14	10.58	7.17	5.46	4.44	3.76	2.39	2.05

TRANSVERSE WIRES

Gauge of Wires	Center to Center Spacing of Transverse Wires in Inches					
	2″	4″	6″	8″	12″	16″
0	155.37	77.69	51.79	38.84	25.89	19.42
1	132.43	66.22	44.14	33.11	22.07	16.55
2	113.96	56.98	37.98	28.49	18.99	14.24
3	98.21	49.10	32.74	24.55	16.37	12.28
4	83.95	41.97	27.98	20.99	13.99	10.49
5	70.87	35.43	23.61	17.72	11.81	8.86
6	69.96	30.48	20.32	15.24	10.16	7.62
7	51.81	25.90	17.27	12.95	8.63	6.48
8	43.40	21.70	14.47	10.85	7.23	5.43
9	36.37	18.18	12.12	9.09	6.06	4.55
10	30.14	15.07	10.05	7.53	5.02	3.77
11	24.01	12.01	8.00	6.00	4.00	3.00
12	18.41	9.20	6.13	4.60	3.07	2.30
13	13.84	6.92	4.61	3.46	2.31	1.73
14	10.58	5.29	3.53	2.65	1.76	1.32

Above weights to be used in computing the weights per 100 square feet of National Steel Fabric.

Example: Weight per 100 sq. ft. of 6″ x 12″ fabric with longitudinal wires No. 0, transverse wires No. 6. Add to weight of longitudinal wire No. 0 spaced 6″ (55.13 lbs.), the weight of transverse wire No. 6 spaced 12″ (10.16 lbs.) making total of 65.29 lbs. per 100 sq. ft.

Area in Square Inches per Foot of Width for Various Spacing of Wires

Wire			Center to Center Spacing												
Gauge *W & M	Diameter Inches	Area Square Inches	2″	3″	4″	5″	6″	7″	8″	9″	10″	12″	14″	16″	18″
6–0	.4615	.16728	1.004	.669	.502	.402	.335	.287	.251	.223	.201	.167	.143	.125	.112
5–0	.4305	.14556	.874	.582	.437	.349	.291	.250	.218	.194	.175	.146	.125	.109	.097
4–0	.3938	.12180	.731	.487	.365	.292	.244	.209	.183	.162	.146	.122	.104	.091	.081
3–0	.3625	.10321	.619	.413	.310	.248	.206	.177	.155	.138	.124	.103	.088	.077	.069
2–0	.3310	.08605	.516	.344	.258	.207	.172	.148	.129	.115	.103	.086	.074	.065	.057
0	.3065	.07378	.443	.295	.221	.177	.148	.126	.111	.099	.089	.074	.063	.056	.049
1	.2830	.06290	.377	.252	.189	.151	.126	.107	.094	.084	.075	.063	.054	.047	.041
2	.2625	.05411	.325	.217	.162	.130	.108	.093	.081	.072	.065	.054	.047	.041	.036
3	.2437	.04664	.280	.187	.140	.112	.093	.080	.070	.062	.056	.047	.040	.035	.031
4	.2253	.03986	.239	.160	.120	.096	.080	.068	.059	.053	.048	.040	.034	.030	.026
5	.2070	.03365	.202	.135	.101	.081	.067	.058	.050	.045	.040	.034	.029	.025	.022
6	.1920	.02895	.174	.116	.087	.069	.058	.050	.043	.039	.035	.029	.025	.022	.019
7	.1770	.02460	.148	.098	.074	.059	.049	.042	.037	.033	.030	.025	.021	.018	.016
7½	.1695	.02256	.135	.090	.068	.054	.045	.039	.034	.030	.027	.023	.019	.017	.015
8	.1620	.02061	.124	.082	.062	.049	.041	.035	.031	.027	.025	.021	.018	.015	.014
9	.1483	.01727	.104	.069	.052	.041	.035	.029	.026	.023	.021	.017	.015	.013	.011
9½	.1416	.01575	.095	.063	.047	.038	.032	.027	.024	.021	.019	.016	.014	.012	.010
10	.1350	.01431	.086	.057	.043	.034	.029	.025	.021	.019	.017	.014	.012	.011	.009
11	.1205	.01140	.068	.045	.034	.027	.023	.019	.017	.015	.014	.011	.009	.008	.007
11½	.1130	.01002	.060	.040	.030	.024	.020	.017	.015	.013	.012	.010	.009	.008	.007
12	.1055	.00874	.052	.035	.026	.021	.017	.015	.013	.012	.010	.009	.007	.006	.006
12½	.0985	.00762	.046	.030	.023	.018	.015	.013	.011	.010	.009	.007	.007	.006	.005
13	.0915	.00657	.040	.027	.020	.016	.013	.011	.010	.009	.008	.006	.006	.005	.004
14	.0800	.00502	.030	.020	.015	.012	.010	.009	.008	.007	.006	.005	.004	.004	.003

*Washburn & Moen.

Reinforced Concrete Slabs

IN the design of reinforced concrete slabs, the styles of National Steel Fabric with heavy longitudinal wires on 3″ or 4″ centers and lighter transverse wires on 12″ or 16″ centers are particularly adaptable, since the longitudinal wires can be placed in the line of principal tension stresses and afford a continuous reinforcement from span to span without requiring any lapping. This considerably reduces the cost of placing the reinforcement when compared to the cost of spacing and wiring loose bars or rods. Furthermore it assures the placing of the reinforcement, *by unskilled labor*, in the proper position in the slab near the under surface between beams and near the upper surface over beams.

Usual practice based upon many tests of long standing, and so incorporated in the building codes of various cities, permits a working stress of 20,000 to 22,000 pounds per square inch for cold drawn wires, whereas only 16,000 pounds per square inch working stress is permitted for hot rolled rods or bars. Therefore, the cross-sectional area of National Steel Fabric, at the most, need only be 80% of that required for hot rolled bars or rods for any given slab loading.

The following table (Table A) has been compiled and copyrighted by Taylor and Thompson, foremost civil engineers and authorities on concrete construction, and is used with their permission. It is reproduced here, in part, from their Text Book on reinforced concrete and represents the best practice in designing concrete slabs with bar reinforcing. It is computed on the assumption of a maximum allowable compression in concrete of 650 pounds per square inch and a maximum allowable tensile strength in steel bars of 16,000 pounds per square inch. The spans are assumed as continuous spans and the formula $BM = \frac{WL^2}{12}$ in which

BM = Bending Moment in foot pounds
W = Total live load in pounds per square inch
L = Length of span in feet

gives the bending moment in foot pounds as used in engineering practice. Having the bending moment per unit width of slab at different loads and span, they have computed the depth of slab (*h*) and cross-sectional area of reinforcing steel (*As*) assuming the ratio of the modulus of elasticity of steel to the modulus of elasticity of concrete to be 15.

The loads at the head of the table cover the usual range of live loads in actual practice and are exclusive of the weight of the actual slab which has been taken into consideration in compiling the table.

Table A

Reprinted, by permission, from TAYLOR & THOMPSON'S "Plain and Reinforced Concrete"
Published by John Wiley & Sons, Inc., New York, 1919

FOR DESIGNING FULLY CONTINUOUS SLABS USING HOT ROLLED BARS
Safe Loadings Per Square Foot, with Thickness of Slab and Steel Required for Given Live Load

Based on $M = \frac{WL^2}{12}$, fc = 650, fs = 16,000, n = 15, 1:2:4 concrete. For $M = \frac{WL^2}{10}$ (wall spans) add 9% to depth of slab and area of steel.
For $M = \frac{WL^2}{8}$ (supported spans) add 20% to depth of slab and area of steel.
h = total thickness of slab. As = area of cross-section of steel per foot of width.

	LIVE LOAD—POUNDS PER SQUARE FOOT*											
Span	40*		50*		60*		70*		80*		90*	
	h	As	h	As	h	As	h	As	h	As	h	As
Ft.	In.	Sq. In.	In.	Sq. In.	In.	Sq. In.	In.	Sq. In.	In.	Sq. In.	In.	Sq. In.
4	3	0.04	3	0.04	3	0.05	3	0.06	3	0.06	3	0.06
5	3	0.06	3	0.07	3	0.08	3	0.09	3	0.09	3	0.10
6	3	0.09	3	0.10	3	0.11	3	0.13	3	0.13	3	0.15
7	3	0.12	3	0.14	3	0.15	3	0.17	3	0.18	3	0.20
8	3	0.16	3	0.18	3	0.21	3½	0.19	3½	0.21	3½	0.22
9	3	0.20	3½	0.20	3½	0.22	3½	0.24	4	0.23	4	0.25
10	3½	0.22	4	0.22	4	0.24	4	0.26	4	0.28	4½	0.30
11	4	0.24	4	0.26	4	0.29	4½	0.31	4½	0.33	4½	0.36
12	4	0.28	4½	0.31	4½	0.34	5	0.34	5	0.37	5	0.39

	LIVE LOAD—POUNDS PER SQUARE FOOT*											
Span	100*		125*		150*		175*		200*		250*	
	h	As	h	As	h	As	h	As	h	As	h	As
Ft.	In.	Sq. In.	In.	Sq. In.	In	Sq. In.	In.	Sq. In.	In.	Sq. In.	In.	Sq. In.
4	3	0.07	3	0.08	3	0.10	3	0.11	3	0.12	3	0.13
5	3	0.11	3	0.13	3	0.15	3	0.17	3½	0.16	3	0.21
6	3	0.16	3	0.19	3½	0.18	3½	0.20	4	0.19	3½	0.25
7	3½	0.18	3½	0.21	4	0.21	4	0.24	4	0.27	4	0.29
8	4	0.21	4	0.24	4½	0.27	4½	0.30	4½	0.33	5	0.33
9	4	0.26	4½	0.30	5	0.31	5	0.35	5	0.38	5½	0.38
10	4½	0.32	5	0.33	5	0.38	5½	0.38	5½	0.43	6	0.43
11	5	0.35	5½	0.37	5½	0.42	6	0.43	6	0.47	6½	0.48
12	5½	0.38	6	0.41	6	0.46	6½	0.48	6½	0.52	7	0.53

*Allowance is made for weight of concrete slab but not for superimposed granolithic or wood flooring. To allow for granolithic (if not considered as part of structural slab) or wood flooring with cinder fill use the column in table corresponding to next larger load than the live load given.

Reinforced Concrete Slabs

WITH NATIONAL STEEL FABRIC REINFORCEMENT

In Table A the authors have used a maximum allowable steel stress of 16,000 pounds per square inch, which is for hot rolled bars as previously stated. With Table A as a basis, it is possible to determine the cross-sectional area of steel required for cold drawn wire using any other allowable steel stress, such as 18,000 or 20,000 pounds per square inch, without appreciable error, by taking an inverse proportion of the unit stresses.

For example, given an allowable stress of 20,000 for cold drawn wire, a 4 ft. span and a live load of 125 pounds per square foot, the cross-sectional area of steel for cold drawn wire would be $\frac{16{,}000}{20{,}000}$ of 0.08 as given in Taylor & Thompson's table (A), or 0.064 square inches per foot.

The following table (B) gives the cross-sectional area of steel required and the style of National Steel Fabric which gives that area for a given span and live load. It is based on the areas of steel found to be required in Taylor & Thompson's table (A), except that the unit allowable stress has been changed from 16,000 pounds to 20,000 pounds per square inch for cold drawn wire.

It is to be noted that Table B should be used for designing continuous spans reinforced with cold drawn wire, and that if freely supported or semi-continuous spans are to be designed, the depth of slab and area of steel required should be increased in accordance with recommendations at the head of Table B.

Table B

FOR DESIGNING FULLY CONTINUOUS SLABS USING NATIONAL STEEL FABRIC AS REINFORCEMENT—UNIT TENSILE STRENGTH OF STEEL 20,000 POUNDS PER SQUARE INCH

Safe Loadings Per Square Foot, with Thickness of Slab and Steel Required for Given Live Load

Based on $M = \frac{WL^2}{12}$, fc = 650, fs = 20,000, n = 15, 1:2:4 concrete. For $M = \frac{WL^2}{10}$ (wall spans) add 9% to depth of slab and area of steel.

For $M = \frac{WL^2}{8}$ (supported spans) add 20% to depth of slab and area of steel.

h = total thickness of slab. As = area of cross-section of steel per foot of width.

LIVE LOAD—POUNDS PER SQUARE FOOT*

Span	40*			50*			60*			70*			80*			90*		
	h	As		h	As		h	As		h	As		h	As		h	As	
Ft.	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style
4	3	0.032	BH1012	3	0.032	BH1012	3	0.040	BH1012	3	0.048	BH912	3	0.048	BH912	3	0.048	BH912
5	3	0.048	BH912	3	0.056	BH812	3	0.064	BH812	3	0.072	BH711	3	0.072	BH711	3	0.080	BH610
6	3	0.072	BH711	3	0.080	BH610	3	0.088	BH610	3	0.104	BH510	3	0.104	BH510	3	0.120	BH49
7	3	0.096	BH510	3	0.112	BH49	3	0.120	BH49	3	0.136	BH38	3	0.144	BH38	3	0.160	TH49
8	3	0.128	BH38	3	0.144	BH38	3	0.168	TH49	3½	0.152	TH49	3½	0.168	TH49	3½	0.176	TH38
9	3	0.160	TH49	3½	0.160	TH49	3½	0.176	TH38	3½	0.192	TH38	4	0.184	TH38	4	0.200	TH28
10	3½	0.176	TH38	4	0.176	TH38	4	0.192	TH38	4	0.208	TH28	4	0.224	TH28	4½	0.240	TH17
11	4	0.192	TH28	4	0.208	TH28	4	0.232	TH17	4½	0.248	TH17	4½	0.264	TH17	4½	0.288	TH06
12	4	0.224	TH28	4½	0.248	TH17	4½	0.272	TH06	5	0.272	TH06	5	0.296	TH06	5	0.312	TH06

LIVE LOAD—POUNDS PER SQUARE FOOT*

Span	100*			125*			150*			175*			200*			250*		
	h	As		h	As		h	As		h	As		h	As		h	As	
Ft.	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style	In.	Sq. In.	N.S.F. Style
4	3	0.056	BH812	3	0.064	BH812	3	0.080	BH610	3	0.088	BH610	3	0.096	BH510	3	0.112	TH610
5	3	0.088	BH610	3	0.104	BH510	3	0.120	BH49	3	0.136	BH38	3½	0.128	TH510	3½	0.152	TH49
6	3	0.128	BH38	3	0.152	TH49	3½	0.144	BH38	3½	0.160	TH49	4	0.152	TH49	4	0.184	TH38
7	3½	0.144	BH38	3½	0.168	TH49	4	0.168	TH49	4	0.192	TH38	4	0.216	TH28	4½	0.240	TH17
8	4	0.168	TH49	4	0.192	TH38	4½	0.216	TH28	4½	0.240	TH17	4½	0.264	TH17	5	0.280	TH06
9	4	0.208	TH28	4½	0.240	TH17	5	0.248	TH17	5	0.280	TH06	5	0.304	TH06			
10	4½	0.256	TH17	5	0.264	TH17	5	0.304	TH06	5½	0.304	TH06						
11	5	0.280	TH06	5½	0.296	TH06												
12	5½	0.304	TH06															

*Allowance is made for weight of concrete slab but not for superimposed granolithic or wood flooring. To allow for granolithic (if not considered as part of structural slab) or wood flooring with cinder fill, use the column in table corresponding to next larger load than the live load given.

For complete description of styles given in Table B, and also other styles, see page 25.

REINFORCED CONCRETE SLAB SECTIONS



Fig. 1. Slab Supported on Concrete Beams



Fig. 2. Slab Supported on Tops of Steel Beams

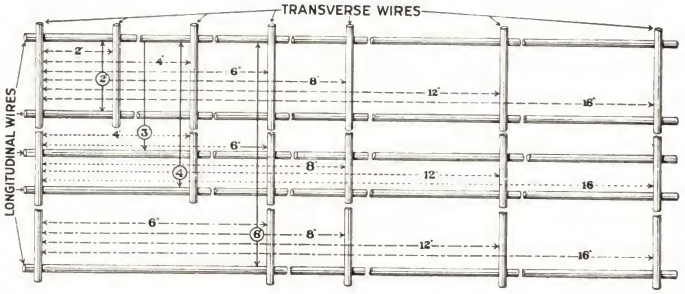


Fig. 3. Steel Beams with Concrete Haunches



Fig. 4. Steel Beams with Complete Concrete Fireproofing

CROSS-SECTIONAL AREA IN SQUARE INCHES PER FOOT OF FABRIC



The diagram above visualizes, in correct proportion, the various center to center wire spacings in which National Building Fabric can be furnished.

In connection with the table of Areas (page 25) the size of wires necessary for any required cross-sectional area, both longitudinally and transversely, can easily be determined.

When the same gauge wire is not required in both members, the heavier size can be placed either longitudinally or transversely, as desired; under no condition, however, should combinations be specified which require a difference between longitudinal and transverse wires greater than 6 full gauges on heavy Styles or 5 full gauges on light Styles; furthermore, a No. 14 wire should never be combined with heavier than No. 11.

Sectional Area of Reinforcing 4″ Cinder Concrete Floor Arches

NEW YORK BUILDING CODE DESIGN

By referring to this table, the sectional area required for a given span and load is quickly determined, and by comparison with the table of Styles (page 25) the proper reinforcement is readily selected.

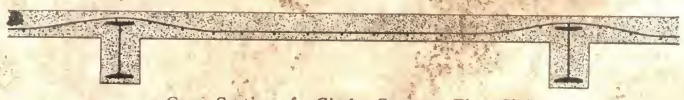
Loads given are total Live and Dead, per square ft.

	SPAN																
Load	4′ 0″	4′ 3″	4′ 6″	4′ 9″	5′ 0″	5′ 3″	5′ 6″	5′ 9″	6′ 0″	6′ 3″	6′ 6″	6′ 9″	7′ 0″	7′ 3″	7′ 6″	7′ 9″	8′ 0″
90	.019	.021	.023	.026	.029	.032	.035	.038	.042	.045	.049	.053	.057	.061	.065	.069	.074
100	.021	.023	.026	.029	.032	.035	.039	.042	.046	.050	.054	.058	.063	.067	.072	.077	.082
110	.023	.025	.029	.032	.035	.039	.043	.047	.051	.055	.060	.064	.069	.074	.079	.085	.090
120	.025	.028	.031	.035	.039	.042	.047	.051	.055	.060	.065	.070	.075	.081	.087	.092	.099
130	.027	.030	.034	.038	.042	.046	.051	.055	.060	.065	.071	.076	.082	.088	.094	.100	.107
140	.029	.032	.036	.041	.045	.049	.054	.059	.065	.070	.076	.082	.088	.094	.101	.108	.115
150	.031	.035	.039	.043	.048	.053	.058	.064	.069	.075	.081	.088	.094	.101	.108	.116	.123
160	.033	.037	.042	.046	.051	.057	.062	.068	.074	.080	.087	.094	.101	.108	.115	.123	.132
170	.035	.039	.044	.049	.055	.060	.066	.072	.078	.085	.092	.099	.107	.115	.123	.131	.140
180	.037	.042	.047	.052	.058	.064	.070	.076	.083	.090	.098	.105	.113	.121	.130	.139	.148
190	.039	.044	.049	.055	.061	.067	.074	.081	.088	.095	.103	.111	.119	.128	.137	.146	.156
200	.041	.046	.052	.058	.064	.071	.078	.085	.092	.100	.108	.117	.126	.135	.144	.154	.164
225	.046	.052	.058	.065	.072	.080	.087	.095	.104	.113	.122	.132	.142	.152	.162	.173	.185
250	.052	.058	.065	.072	.080	.088	.097	.106	.115	.125	.136	.146	.157	.169	.180	.193	.205
275	.057	.064	.072	.080	.088	.097	.107	.117	.127	.138	.149	.161	.173	.185	.198	.212	.226
300	.062	.069	.078	.087	.096	.106	.116	.127	.139	.150	.163	.175	.189	.202	.216	.231	.246
325	.067	.075	.085	.094	.104	.115	.126	.138	.150	.163	.176	.190	.204	.219	.234	.250	.267
350	.072	.081	.091	.101	.112	.124	.136	.148	.162	.175	.190	.204	.220	.236	.253	.270	.287
375	.077	.087	.098	.109	.120	.133	.146	.159	.173	.188	.203	.219	.236	.253	.271	.289	.308
400	.082	.092	.104	.116	.128	.141	.155	.170	.185	.200	.217	.234	.251	.270	.289	.308	.328
425	.087	.098	.110	.123	.136	.150	.165	.180	.196	.213	.230	.248	.267	.286	.307	.327	.349
450	.093	.104	.117	.130	.144	.159	.175	.191	.208	.225	.244	.263	.283	.303	.325	.347	.370
475	.098	.110	.123	.138	.152	.168	.184	.201	.219	.238	.257	.278	.299	.320	.343	.366	.390
500	.103	.116	.130	.145	.160	.177	.194	.212	.231	.250	.271	.292	.314	.337	.361	.385	.411

NOTE: National Steel Fabric meets all the requirements of the New York Building Code, which reads, in part, as follows:

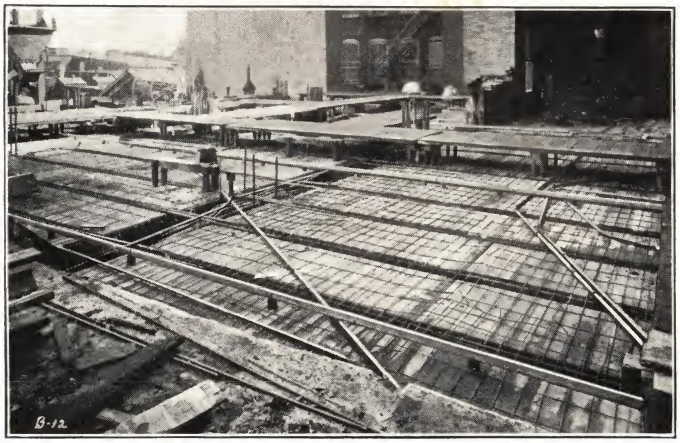
ARTICLE 17, SECTION 354, PARAGRAPH 4-e:

"*Strength of Concrete Slabs.* In determining the safe carrying capacity of concrete slab floor fillings the gross load in pounds per square foot of floor surface shall not exceed the product of the depth in inches of the reinforcement below the top of the slab, by the cross-sectional area in square inches per foot of width of the tensional steel, divided by the square of the span in feet, all multiplied by the following co-efficients when cinder concrete is used; 14,000 if the reinforcement is not continuous over the supports, 18,000 if the reinforcement consists of rods or other shapes securely hooked over or attached to the supports, and 26,000 *if the reinforcement consists of steel fabric continuous over the supports,* and, when stone concrete is used, 16,000, 20,000, and 30,000, respectively." (Note: This rule applies for spans 8 feet or less.)



Cross-Section of a Cinder Concrete Floor Slab Reinforced with National Steel Fabric

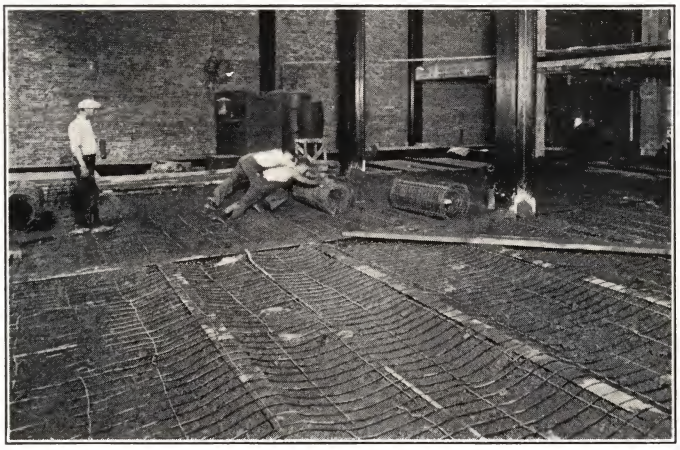
REINFORCED STONE-CONCRETE FLOORS



United Brethren Building, Dayton, Ohio
Fred J. Hughes Company, Dayton, Ohio, *Architects*
Bergendahl & Aker Co., Dayton, Ohio, *Contractors*

Those styles of National Steel Fabric having heavy longitudinal wires on 3″ or 4″ centers with lighter transverse wires on 16″ centers, adapt themselves very readily to reinforced concrete floor slab construction. The above illustration shows National Steel Fabric in place before pouring the floor slabs.

REINFORCED CINDER-CONCRETE FLOORS

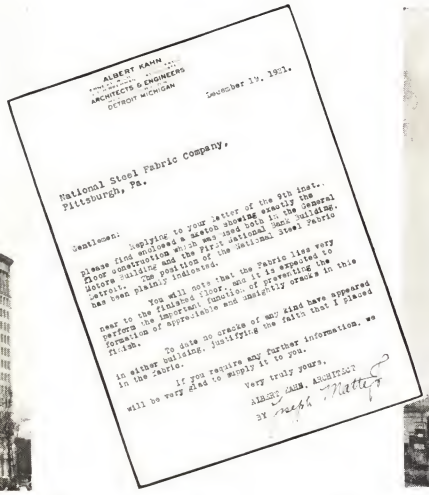


A New York Cinder-Concrete Floor Job
Schwartz & Gross, New York City, *Architects*
Lambaer Const. Co., New York City, *Contractors*
Standard Arch Co., New York City, *Fireproofers*

The use of cinder-concrete floor slabs is a common practice in New York and National Steel Fabric has been used in a number of important buildings. The area of steel required is determined by an empirical formula in use in New York City since 1916. A table giving the cross-sectional area of steel required is shown on page 28 of this catalog.



General Motors Building, Detroit, Mich.—the largest office building in the world. Albert Kahn, Architect. Floors temperature reinforced with more than 2,000,000 square feet of National Steel Fabric



ALBERT KAHN
ARCHITECT & ENGINEER
DETROIT MICHIGAN

November 19, 1921.

National Steel Fabric Company,
Pittsburgh, Pa.

Gentlemen:

Please find enclosed a sketch showing exactly the floor construction which was installed in the General Motors Building and the Fire Department Garage in Detroit. The position of the National Steel Fabric has been plainly indicated.

You will note that the Fabric lies very near to the finished floor, and it is expected to perform the important function of preventing the formation of objectionable and unsightly cracks in this finish.

To date no cracks of any kind have appeared in either building, justifying the faith that I placed in the fabric.

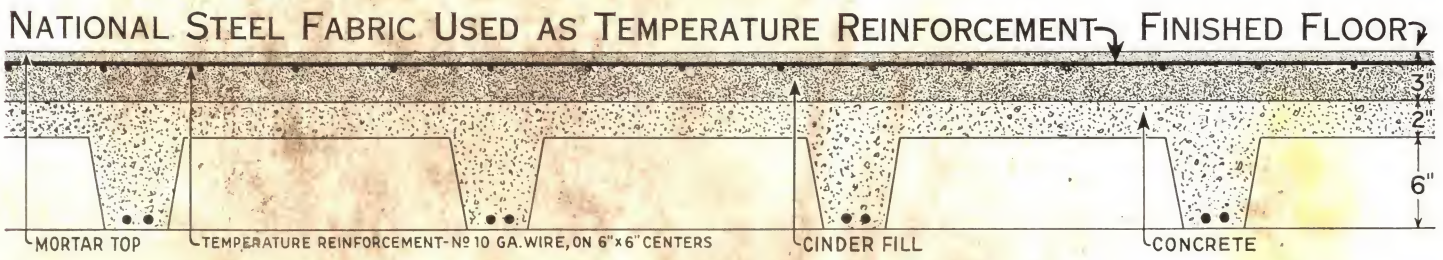
If you require any further information, we will be very glad to supply it to you.

Very truly yours,
ALBERT KAHN, Architect
BY

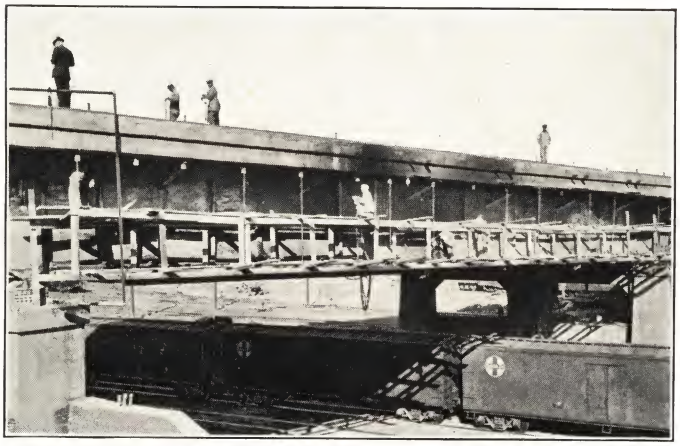
Sketch below shows Mr. Kahn's method of using National Steel Fabric as temperature reinforcement



First National Bank Building, Detroit, Mich. Albert Kahn, Architect. Floors temperature reinforced with National Steel Fabric



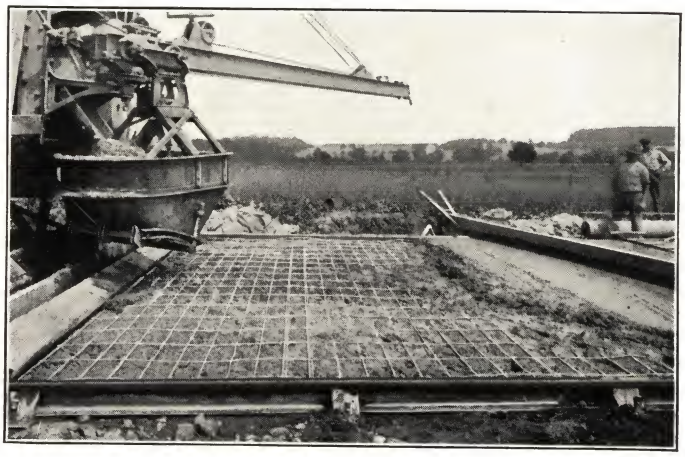
BEAM WRAPPING—FIREPROOFING



Holmes Street Viaduct, Kansas City, Mo.
Pratt-Thompson Const. Co., Kansas City, Mo., *Contractors*

Fireproofing, or beam wrapping, is a method of protecting steel framework of all kinds against fire and against corrosion, and to obviate the necessity for periodical painting, by covering it with a coating of reinforced concrete. National Steel Fabric becomes embedded in the concrete which it reinforces against cracking and spalling due to expansion, contraction, impact, fire, water, etc.

REINFORCED CONCRETE ROADS



Route 178, Montgomery County, Pa.
E. A. Corson, Ocean City, N. J., *Contractor*

Practically all concrete roads and pavements built today are reinforced with steel to resist tension stresses engendered by loading, impact, soft subgrade, freezing and thawing of subgrade, internal stresses while the concrete is setting, and other causes.

Write for the National Road Fabric Bulletin which covers this subject very thoroughly.

CONCRETE AND GYPSUM POURED ROOFS AND PRECAST ROOFING TILE



Installing a Marks System Gypsum Roof
Clay Products of America, New Hope, Pa.
Insert: A Type of Precast Reinforced Cement Tile

Practically all modern systems of roof construction, both poured and precast, require a wire fabric reinforcement to resist tensile stresses. As this construction is similar in form to building slabs, the styles of National Steel Fabric with heavy longitudinal wires on 3″ or 4″ centers and lighter transverse wires on 12″ or 16″ centers, admirably fit the requirements.

REINFORCED CONCRETE STREETS



Street in the City of Richmond, Va.
McGuire-Rolfe Co., Richmond, Va., *Contractors*

Reinforced concrete city streets, always clean, smooth and easy riding, give the taxpayer a 100% investment.

Even the concrete bases for brick, asphalt or other pavement surfaces are often reinforced.

The above picture shows the placing of National Road Fabric in the concrete base of an asphalt surfaced pavement in Richmond, Virginia.

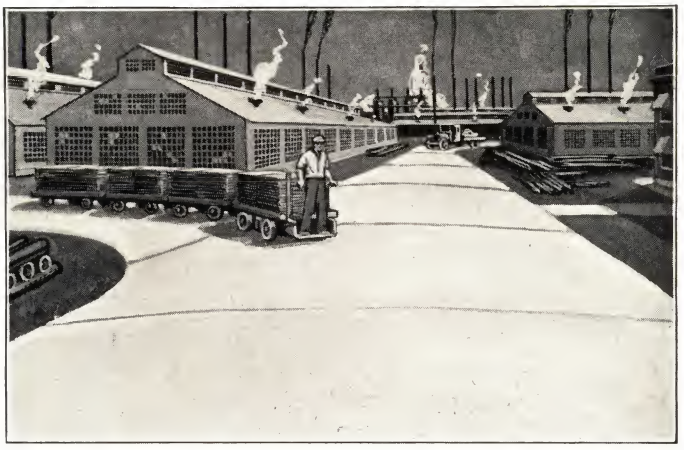
"GUNITE" OR CEMENT GUN WORK



Cement Gun Work, Highland Park Reservoir, Pittsburgh, Pa.
A. V. Purnell, Pittsburgh, Pa., *Contractor*

The use of the "cement gun" where the densest possible concrete in a comparatively thin layer is required, insures the most economical method of covering large areas, such as reservoirs, dams, etc. Such construction requires National Steel Fabric with equal cross-sectional area in both directions to resist tensile stresses.

REINFORCED CONCRETE INDUSTRIAL DRIVEWAYS



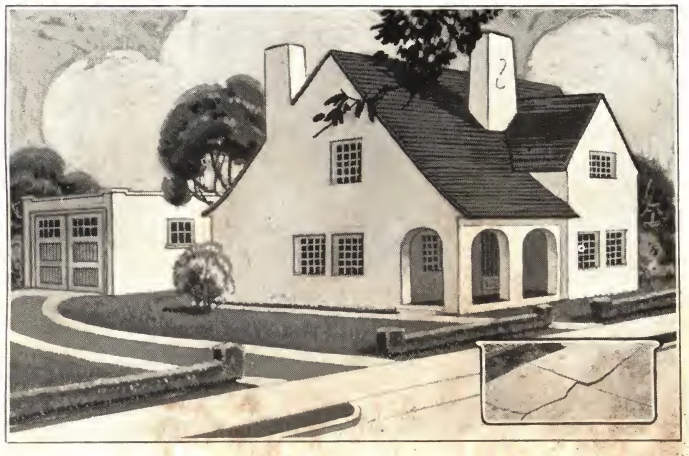
A Typical Example of Reinforced Concrete Driveways at an Industrial Plant

Industrial driveways or factory yards are invariably submitted to the heaviest kind of trucking.

When properly constructed of reinforced concrete, they reduce charges immediately and outlast any other type of construction.

Write for the National Road Fabric Bulletin.

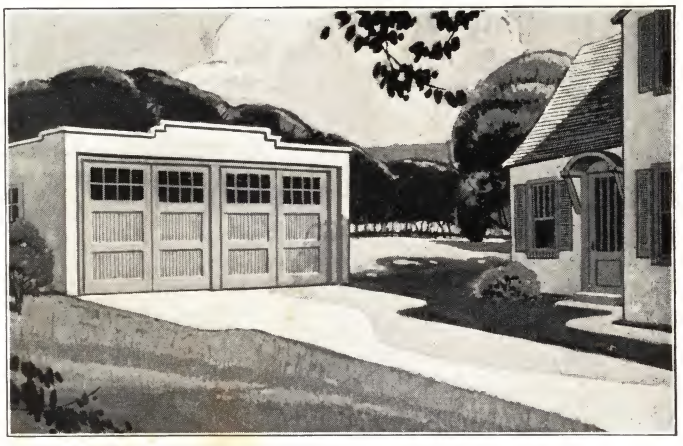
REINFORCED CONCRETE SIDEWALKS



Reinforced Concrete Sidewalks Cannot Fail Like the One Shown in the Insert Above

A comparatively light style of National Steel Fabric as a reinforcement will add only a few cents per square yard to the cost of the sidewalk and will quickly pay for itself by added years of life and the prevention of unsightly cracks and spalling.

REINFORCED CONCRETE PRIVATE DRIVEWAYS



Softening and Freezing of the Soil Causes Concrete to Crack—Reinforcing Prevents Cracking

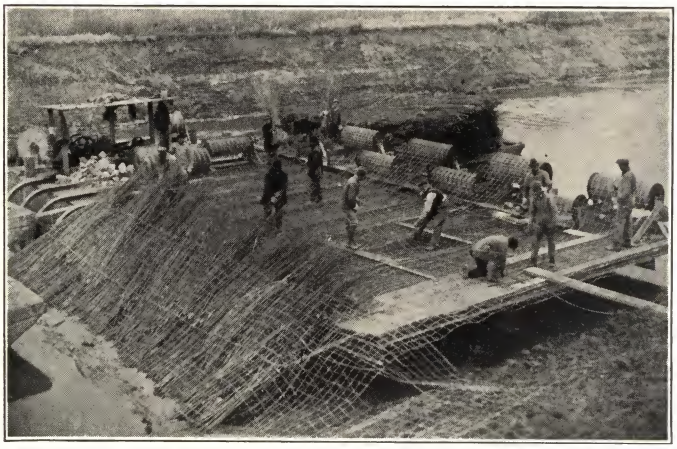
Driveways around the home and garage should be designed with the same care as the modern reinforced concrete road. The use of the proper style of National Steel Fabric will add considerably to the life of the driveway and will assist in preventing cracks.

REINFORCED CONCRETE PIPE



The use of National Steel Fabric in reinforced concrete pipe has grown rapidly, chiefly because the rigidity of the fabric keeps the wires in the proper place and prevents slipping of the transverse wires on the main wires. These two qualities are of very great importance when the comparatively thin pipe shell is considered.

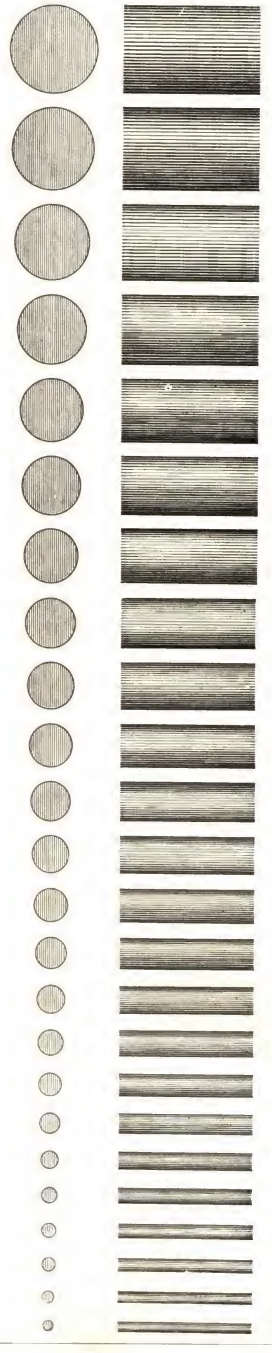
GENERAL WORK



Many additional uses exist for National Steel Fabric for reinforcing concrete and other construction, such as levee lining, canal lining, mine shaft lining, vaults, walls, etc., but are not covered in detail in this catalog.

Write the nearest National Steel Fabric Company Office for assistance in your problems.

PLAIN WIRE

Full Sizes of Plain Wire	W & M Gauge No.	Diam. Inches	Area Sq. Inches	Circum. Inches
	6–0	.4615	.16728	1.44985
	5–0	.4305	.14556	1.35246
	4–0	.3938	.12180	1.23716
	3–0	.3625	.10321	1.13883
	2–0	.3310	.08605	1.03987
	0	.3065	.07378	.96290
	1	.2830	.06290	.88907
	2	.2625	.05411	.82467
	3	.2437	.04664	.76561
	4	.2253	.03986	.70780
	5	.2070	.03365	.65031
	6	.1920	.02895	.60319
	7	.1770	.02460	.55606
	8	.1620	.02061	.50894
	9	.1483	.01727	.46590
	10	.1350	.01431	.42412
	11	.1205	.01140	.37856
	12	.1055	.00874	.33144
	13	.0915	.00657	.28746
	14	.0800	.00502	.25133
	15	.0720	.00407	.22619
	16	.0625	.00306	.19635
	17	.0540	.00229	.16965
	18	.0475	.00177	.14923

CONCLUSION

The ultimate purpose of National Steel Fabric Reinforcement is to eliminate entirely or, at least, to reduce materially the cost of maintaining concrete structures and concrete products, by increasing their life.

While we know that concrete is the most adaptable construction material of the present century, and that its maintenance cost is relatively very low, we also know that concrete is relatively low in its resistance to tensile stresses and requires the addition of steel to lengthen life and prevent failure.

National Steel Fabric has been developed to supply the demand for a high grade cold drawn steel wire fabric, giving any desired cross-sectional area in either direction, and absolutely rigid in itself.

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